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資料- 1 : 情報収集フォーマット



水道事業体における DX 活用促進

情報収集フォーマット

国際協力機構（JICA）

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説明

シート名	作業説明	活用方法
1. KPIシート（発展段階評価）	① 「(2) KPI入力シート」 I26～K37に、過去3年間分のKPI値を入力する。 ・「(1) 事業体の発展段階評価 ヘンチマーク」に沿って、各指標毎に発展段階レベルが自動で表示される。 ② 「(2) KPI入力シート」 L列に、各KPI値のトレンドを矢印で記入し、トレンドを把握する。 ③ 「(2) KPI入力シート」 P列に、出典/情報源を記入する。 ④ 「(2) KPI入力シート」 Q列に、各KPI値からみたパフォーマンスやトレンドの簡易分析を	・KPI分析から事業運営のパフォーマンスや課題となる分野を概略で把握し、現状分析を行う際の基礎情報とする ・執務参考資料「発展段階ごとにみられる一般的な課題リスト」、「発展段階毎に目指すべきデータ取得・デジタル活用レベル」を参照する際に活用する
2. 現状・課題分析（水道事業運営）	① 既存の経営計画・戦略（タイトル/策定年度）、開発ドナーの支援概要に関する情報を左上、右上に各々記入する ② F列に、ヒアリング、既存の計画・戦略および開発ドナーの情報を基に、事業運営における現状と課題を整理する。 ③ G列に、重点施策や戦略を整理する。 ④ H列に、③の出典/情報源を記載する。	・事業体の課題や既存の施策・戦略に関する情報を基に、事業体を取り組むべき分野や重点的に成長を促進すべき分野を特定する ・デジタルソリューションの検討、優先順位付けの際に同情報を活用する
3. 現状・課題分析（デジタル）	① E列に、ヒアリング、既存の計画・戦略等の情報を基に、デジタルシステム活用における現状と課題を整理する。 ② F列に、デジタル化レベル評価の6つの観点のどれに該当するのかを記載する。（ドロップダウンリストで1つを選択する形式となっているが、複数選択しても問題ない） ③ G列に、デジタル化レベル評価の4段階の評価点を記載する。	・デジタルに関連した課題や、既存の施策・戦略について把握し、デジタル化レベル評価を行う際の基礎情報とする ・経営要素別（大項目、中項目）に整理した情報とデジタル化レベル評価6つの観点の該当を整理する
4. 業務プロセス	① E5～E7にヒアリング等から得られた作業内容や課題等の情報を記載する。 ② 列12以降に業務で活用しているシステムとデータの情報を記載する。（ID等はシート5,6,7と整合を図る） ③ 業務フローはシステム処理と手動処理に分けて記載する。システム処理は②で整理した処理を中心に記載をする。手動処理は人力で処理しているないようを記載する。（②で記載ものの内、手動で実施している処理はこちらに記載した方がよい）	・現状・課題分析の結果、課題が発見された業務プロセスに関して深掘りして整理する ・全ての業務に対して作成するのではなく、課題があると特定したもののみ作成する想定である
5. システム一覧	① 行3に示される項目についてヒアリング、既存の計画等の情報から整理する。	・導入されているシステムの一覧表を整理し、デジタル化状況の把握に活用する ・現地調査前に質問表等でシステム一覧を作成できると円滑な調査/ヒアリングが可能となる
6. データー一覧	① 行3に示される項目についてヒアリング、既存の計画等の情報から整理する。	・収集されているデーター一覧表を整理し、デジタル化状況の把握に活用する。
7. 対応表	① 行3に示される項目についてヒアリング、既存の計画等の情報から整理する。	・デジタルアーキテクチャ作成のため、システムとデータの関係性を明確にする。

1. KPIシート（発展段階評価）

（１）事業体の発展段階評価 ベンチマーク

分野	成長スパイラル分類	KPI No. *1	重要業務指標 (KPIs)	重要業務指標 (KPIs)(英語表記)	発展段階評価のベンチマーク			
					1	2	3	4
サービス水準	1. サービス改善と投資活動	5	給水時間(h/日)	Continuity of Service (Hrs/day)	Less than 12h/d	12-24h/d	24h/d	－
		6	給水水質(%)	Quality of water supplied (Compliance rate: %)	(Untreated/turbid. Water)	WQ compliance rate less than	(WQ compliance rate (80%-90%))	(Compliance rate 90% or more)
事業規模	2. 顧客基盤と満足度の向上	10	給水普及率(%)	Service coverage / Water coverage (%)	(Below 50%)	(50-80%)	(80% or more)	(95% or more)
採算性	3. 料金収入の増加	15	料金徴収率(%)	Collection ratio (%)	(60% or less)	(60-85%)	More than 85%	(98-100%)
		16	無収水率(%)	Non-revenue water ratio(%)	(40% or more)	(25-40%)	Less than 25%	(10- 25%)
		17	メータ設置率(%)	Metering ratio (%)	(80% or less)	(80-95%)	(Aim for 100% (95-99%))	(99-100%)
収益性	4. 経営と財務の改善	22	EBITDAマージン(%)	EBITDA margin (%)	(Negative)	(0%-30%)	Aim for 30% or more	－
		25	売上高経常利益率(%)	Operating Profit Margin(%)	(Negative)	(Less than 10%)	(Aim for 10% or more)	－
財務健全性		26	自己資本比率(%)	Equity ratio (%)	－	(Less than 40%)	(Aim for 40% or more)	－
		27	固定長期適合率(%)	Fixed long term conformity rate (%)	－	(Above 110%)	Aim for less 110%	－
		28	O&Mコストカバー率(%) *2	O&M cost coverage ratio (%)	(Less than 100)	(100-130)	(Above 130)	－
人的資源		35	1000接続あたりの職員数 *2	Number of staff per 1,000 connections	(11 or more)	(6.5-11)	(4.0-6.5)	(Less than 4.0)

出典：「全世界（広域）クラスター事業戦略「水道事業体成長支援」に基づく経営改善指導を通じた情報収集・確認調査」、JICA「クラスター事業戦略「水道事業体成長支援」」のモニタリング指標

[注記] 全体 --- ベンチマーク値は、JICAが「クラスター事業戦略「水道事業体成長支援」」のモニタリングに用いている閾値であり、上の段階に上がる目安の指標値。() 内のベンチマーク値は、前述のモニタリングに用いている閾値ではないが、当該段階の目安値として示したもの。

*1 --- KPI No.は、上記調査のKPI番号に準じている。同KPIシートでは35の指標があるが、本シートではその中から発展段階を評価する12指標を抜粋している。

*2 --- JICAが2026年2月時点で「クラスター事業戦略「水道事業体成長支援」」のモニタリングに用いている26の指標には含まれていないが、調査団として提案している指標

（２）KPI入力シート

分野	成長スパイラル分類	KPI No.	重要業務指標（KPIs）	重要業務指標（KPIs） （英語表記）	算定式	KPI値			KPI値 トレンド	発展段階評価			出典／情報源	発展段階に関するKPI分析
						202X	202X	202X		202X	202X	202X		
サービス水準	1. サービス改善と投資活動	5	給水時間(h/日)	Continuity of Service (Hrs/day)	－					NA	NA	NA		
		6	給水水質(%)	Quality of water supplied (Compliance rate: %)	(法定水質基準順守回数/ 法定試験水質調査回数) ×100%					NA	NA	NA		
事業規模	2. 顧客基盤と満足度の向上	10	給水普及率(%)	Service coverage / Water coverage (%)	(給水人口/給水対象エリアの人口) ×100%					NA	NA	NA		
採算性	3. 料金収入の増加	15	料金徴収率(%)	Collection ratio (%)	(料金徴収総額/ 料金請求総額) ×100%					NA	NA	NA		
		16	無収水率(%)	Non-revenue water ratio(%)	(水道システム投入水量－料金請求対象水量（有収水量） / 水道システム投入水量) ×100%					NA	NA	NA		
		17	メータ設置率(%)	Metering ratio (%)	(メータ設置顧客接続数/ 全顧客接続数) ×100%					NA	NA	NA		
収益性	4. 経営と財務の改善	22	EBITDAマージン(%)	EBITDA margin (%)	(営業CF/売上高) ×100%					NA	NA	NA		
25		売上高経常利益率(%)	Operating Profit Margin(%)	(経常利益－補助金（長期前受金戻入）/売上高) ×100%					NA	NA	NA			
財務健全性		26	自己資本比率(%)	Equity ratio (%)	(総資本/総資産) ×100%					NA	NA	NA		
		27	固定長期適合率(%)	Fixed long term conformity rate (%)	(固定資産/（固定負債 ＋ 総資本）) ×100%					NA	NA	NA		
		28	O&Mコストカバー率(%) ^{*1}	O&M cost coverage ratio (%)	(事業収入（水道事業収入＋下水事業収入＋補助金）／O&Mコスト（減価償却費、利払いは除く）)×100%					NA	NA	NA		
人的資源		35	1000接続あたりの職員数 ^{*1}	Number of staff per 1,000 connections	職員数／1000接続					NA	NA	NA		

[注記] *1 --- JICAが2026年2月時点で「クラスター事業戦略「水道事業体成長支援」」のモニタリングに用いている26の指標には含まれていないが、調査団として提案している指標

※3年間のトレンドを下表矢印で記載

↗
→
↘

2. 現状・課題（水道事業運営）

既存の経営計画・戦略		開発ドナーの支援状況	
タイトル/ 年度		ドナー/ 概要	
1		JICA: xxx プロジェクト	
2		・	
3		・	
4		xxx :	

経営要素				課題・経営戦略		
大項目	中項目		確認項目例	水道事業運営における現状・課題	重点施策・戦略（目安：5年程度）	出典/情報源
設備投資戦略	1a	プロジェクトプランニング	水源の確保 水需要予測の実施 施設整備・拡張計画			
	1b	資産管理、設備設計、 ライフサイクル管理	資産情報の管理・記録 施設・設備の更新・修繕計画			
	1c	プロジェクト執行、マネジメント	プロジェクト情報の管理 進捗管理			
	1d	設備・資材、調達戦略	調達管理 設備・資機材の出庫管理			
運営維持管理	2a	オペレーション	取水/浄水/送配水の運用状況 給水時間/水量/水圧の状況 水質管理状況 職員の知識・技能			
	2b	メンテナンス （漏水対策含む）	施設の維持管理状況 漏水対策・活動、維持管理計画・活動 予防的メンテナンス 職員の知識・技能			
顧客サービス	3a	検針	検針状況（マニュアル作業） 検針の正確性と効率性			
	3b	請求と回収/料金設定	料金請求・徴収状況 料金水準、料金改訂			
顧客サービス	3c	顧客情報	顧客情報の記録・更新 顧客情報の正確さ			
	3d	不良債権回収	未収金の管理 未収金回収の対策・活動			
	3e	カスタマーサービス	顧客対応 苦情受付・対応 顧客満足度調査			
サポート機能	4a	ファイナンス/財務	営業収支 キャッシュフロー 負債、補助金			
	4b	人事/人材育成	組織・人員体制 人材育成体制・計画 人事管理			
	4c	サプライチェーンマネジメント	調達 物流 在庫管理			
	4d	情報技術/デジタル化	IT戦略 デジタルインフラ/セキュリティの水準 デジタル人材			
	4e	その他法務、環境保護 ...	水源保全 関連法・規制			
その他	5a	政策,法整備,規制機関	監督官庁 関連法制度 規制機関（水資源管理、料金）			

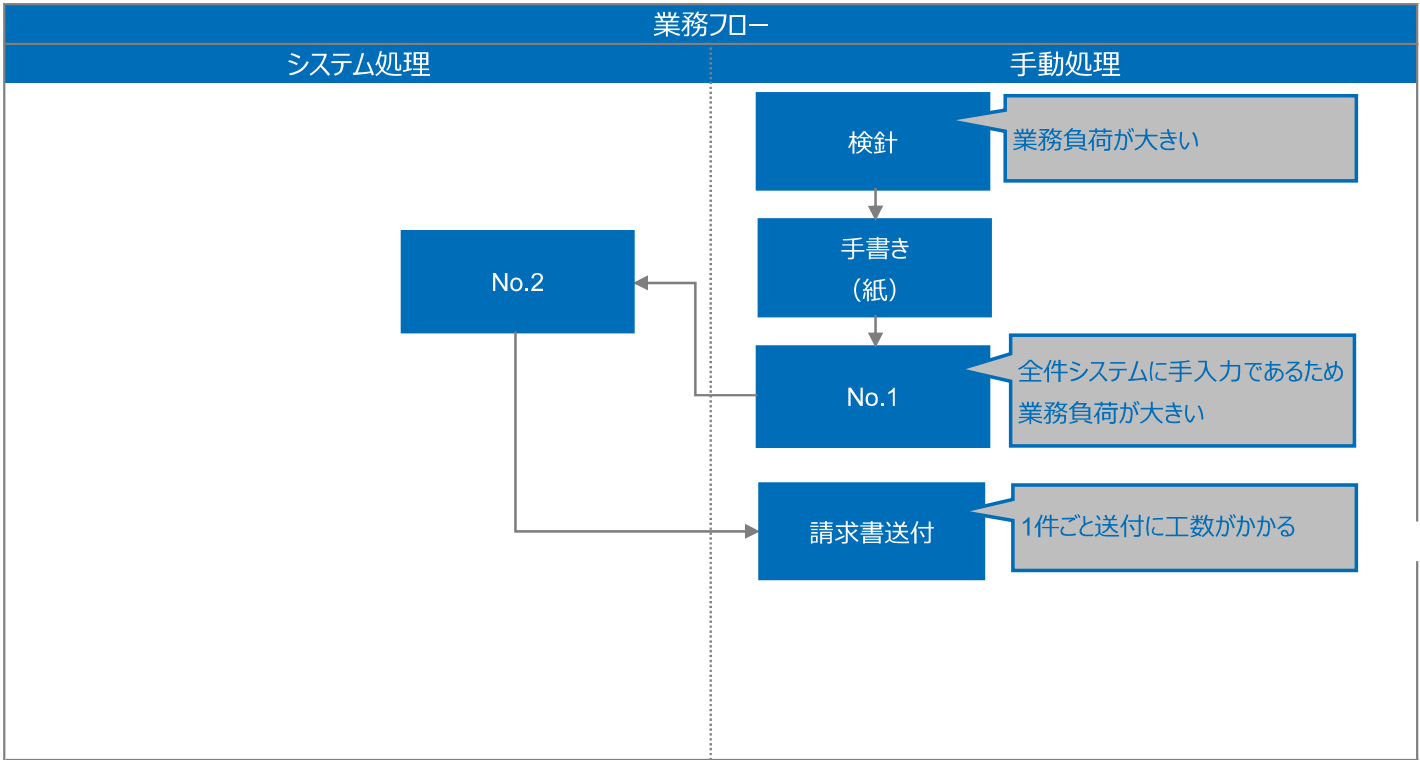
3. 現状・課題（デジタル）

経営要素			デジタルにおける現状・課題	デジタル化 レベル評価	
大項目	中項目			パラメータ (観点)	レベル
設備投資 戦略	1a	プロジェクトプランニング			
	1b	資産管理、設備設計、 LC管理			
	1c	プロジェクト執行、マネジ メント			
	1d	設備・資材、調達戦略			
運営 維持管理	2a	オペレーション			
運営 維持管理	2b	メンテナンス			
顧客 サービス	3a	検針			
	3b	請求と回収/料金設定			
	3c	顧客情報			
	3d	不良債権回収			
	3e	カスタマーサービス			
サポート機能	4a	ファイナンス/財務			
	4b	人事/人材育成			
	4c	サプライチェーンマネジメン ト			
	4d	情報技術/デジタル化			
	4e	その他法務、環境保護 ...			
その他	5a	政策,法整備,規制機関			

4. 業務プロセス

〇〇業務のプロセス		
業務状況	主な作業内容	・各家庭のメーターを担当者が目視確認 ・事務所に戻って手書き用紙に数値を記入 ・入力担当者が手書き用紙からシステムに入力 ・システムにより料金算定後、請求書を送付
	部署・担当者数	〇〇部署・〇〇人
	課題	・現地確認した検針水量を紙に記録後手動でシステムに入力している。 →現在の職員体制での人海戦術による検針は給水区域を拡大した際に難しくなる

システムとデータ							
処理No.	インプット		処理		アウトプット		後工程
	DATA_ID	データ	SYS_ID	使用システム	DATA_ID	データ	
1	-	紙	SYS_04	SUMS	DATA_04	検針	請求
2	DATA_04	検針	SYS_04	SUMS	DATA_05	請求	回収



[illegible]

6. データ一覧

[illegible]

7. 対応表

[illegible]

資料- 2 : 補足資料 (Digital Capability Map チェックリスト)

Digital Capability Mapチェックリスト

			Level 1	Level 2	Level 3	Level 4	Level 5	コンポーネントの有無	能力・活用レベル
①Engagement Channels	Customer Touch Points		Physical Mail						
				Email					
				SMS/Whatsapp					
				Call center & IVR					
					Customer Servicing portal				
					Customer Mobile App				
	Work Force Touch Points (MI, MOD, Contractors, Etc.)				Messaging Services (WhatsApp, Viber)				
					Kiosk				
						AI enabled Chatbot			
					Work Force Portal				
					Employee Mobile App				
					Intranet				
					Meter reading app				
					Management Dashboards				
					POS Devices				
					NRW Dashboard				
						Mobile device mgmt.			
						Early Warning Systems			
	External / 3 rd party Intergrations				Payment Gateway				
							Social Media Intergation		
							Weather services		
							Banking Services		
	Engagement Channel Functions						Space agencies		
							Government agencies		
				Document Mgmt.	Customer Portal Mgmt.				
					Employee Portal Mgmt.				
						Customer Relationship Mgmt.(CRM)			
						Customer Communication Mgmt.			
						Employee Relationship Mgmt.			
							Partner Mgmt.		
②Data & Analytics	Data Platform	Data Ingestion				ETL/ELT			
						Data Replication			
						Event Messaging			
						Batch			
						Change Data Capture			
						Data Streaming			
		Data Storage			Raw Data				
					Relational Database				
					Cached/Fast Access Data				
						Staging Data			
						ODS			
						Enterprise Data Warehouse			
						Specialized Data Marts			
						Archiving			
							Unstructured Data		
							External Data		
		Business Intelligence &Reporting			MIS Reports				
					Regulatory Reports				
					Operational Reports				
					Adhoc Reports				
	Analytics					Data Visualization			
							Self-service Analysis		
							Data Discovery & Search		
							Analytics Sandbox		
		Advance Analytics				Descriptive & diagnostics analytics			
							Predictive, Prescriptive analytics		
							GIS, Geo Spatial Analytics		
	Data Management & Governance					Orchestration & Scheduling			
						Customer Master			
						GIS Master			
						Asset Master			
						Reference Data			
						Data Catalogue			
						Data Lineage			
						Data Quality Management			
						Data Stewardship			
						Data Policies			
	AI Platform & Operations						AI / ML Models		
							AI agent		
							Prompt Ops		
							ResponsibleAI Govenance		
							AI Guardrails		
							LLMs		
							AI / ML Services		

			Level 1	Level 2	Level 3	Level 4	Level 5	コンポーネントの有無	能力・活用レベル	
③Core Business Capabilities	Productions & Distribution				SCADA systems					
					Production mgmt. systems					
					Water qullity monitoring systems					
						Automated Dosing Systems				
						Variable frequency drives(VFDs)				
						Programmable logic controllers(PLCs)				
						Hydraulic modeling systems				
						Remote terminal units				
	Metering operations			Billing & Arrears						
					Payments					
					DMA mgmt					
	Asset Management				Revenue mgmt					
					Asset Data Mgmt					
					Asset Register Mgmt.					
					Asset Design & Build					
	Inventory Management				Asset Monitoring					
					Asset Maintenance	GIS Management				
					Inventory Mgmt.					
					Inventory Planning					
					Inventory Sourcing					
	Field Force Mgmt				Contractor Mgmt.					
					Store Keeping					
				Meter Reading & Inspection						
				New Connections						
				Servicing & complaints						
					Maintenance					
			Surveying							
		Service Delivery & Planning			Work Flow Management					
				Work Resource Planning						
				Work Scheduling						
				Customer Orders Managements						
				Beat Plannning						
		Field Force Training Mgmt			SOP					
				Training Manuals						
				Field Force Support						
			Knowledge Base							
Enterprise Resource Planning				Human Resources						
				Finance						
				Supply Chain And Procurement						
				Vendor, Contractor & Partner Mgmt.						
				LCPM system						
				Administrator & Office Mgmt.						
		Real estate mgmt.								
		Governance, Risk & compliance mgmt								
④Infrastructure	Digital Infrastructure			Network and Comms						
				IT facility mgmt.						
				Backup & Archival						
				Sensors and IoT Gateway						
					Cloud Management					
					Fault & Performance Monitoring					
			Logging							
				IT device mgmt.						
				Smart Meters						
	Physical Infrastructure		Chemical Building							
			Clarifier							
			Receiving Wells							
			Drainage Tank							
			Coagulation and Flocculation Tank							
			Clear Well Tank + Booster Pumps							
			Reservoir							
Deep Tube Wells										
Elevated Tanks										
Dewatering facility										
Boosting Stations										
Pipelines										
Valves										
⑤Intergration & Data Exchange					File Transfer Services					
					Scheduling & Workflow Mgmt					
					API Orchestration					
					Pub Sub Mgmt					
					Internal Gateway					
					Adapter & Connectors					
		Encryption & Masking								
			External Gateway							
⑥Security & Identity Mgmt.					Authentication					
					Identity Mgmt.					
					Authorization & Access Controls					
					Single Sign-on					
				Cyber Security Governance						

資料- 3 : 参考文献リスト

資料3 参考文献リスト

No.	Document Title	Type
BWSSB		
1	BWSSB, "Blueprint for the future (Vision)"	electronic data
3	JICA 「ベンガルール上下水道整備事業(フェーズ3)最終報告書 和文要約」 JICA "Preparation Survey on Water and Sewerage Facility Development in Bengalore City (Phase3) Final Report Summary"	electronic data
4	JICA 「インド自動漏水音検知器を用いた漏水検知システムの普及実証事業業務完了報告書」	electronic data
5	BWSSB, "IT Initiative" ppt	electronic data
6	Deccan Herald Article, "BWSSB to replace 40-yr-old pipelines to bring down water leakages" https://www.deccanherald.com/india/karnataka/bengaluru/bwssb-to-replace-40-yr-old-pipelines-to-bring-down-water-leakages-3683320	electronic data
2	Deccan Herald Article, "BWSSB to replace 40-yr-old pipelines to bring down water leakages" https://www.deccanherald.com/india/karnataka/bengaluru/bwssb-to-replace-40-yr-old-pipelines-to-bring-down-water-leakages-3683320	electronic data
7	IWA, "Building Bengaluru's water future: identifying challenges and a strategic blueprint for sustainable management" https://iwaponline.com/wp/article/27/9/1036/109218/Building-Bengaluru-s-water-future-identifying	electronic data
SRWSA		
1	SRWSA, "Business Plan 2022-2026	electronic data
2	JICA "SRWSA-Presentation 16 Feb 2024 (DX 調査用抜粋) "	electronic data
3	JICA "事業事前評価表_SR スマートシティ ph1&ph2"	electronic data
4	JICA "カンボジア国シェムリアップ上水道拡張整備事業準備調査報告書"	electronic data
5	JICA "JICA 中小企業支援ジオクラフト_報告書"	electronic data
6	MISTI, "Water Supply Data -Public Water Utility-"	electronic data

資料- 4 : 収集資料リスト

資料 4 収集資料リスト

No.	Document Title	Type
BWSSB		
1	Annau Accounts 2020-21.pdf	electronic data
2	Annual Accounts 2019-20.pdf	electronic data
3	Annual Accounts 2021-22.pdf	electronic data
4	Annual Accounts 2022-23.pdf	electronic data
5	BWSSB Sajala User Manual SRS.doc	electronic data
6	JalaSnehi_SRS_Document.pdf	electronic data
7	Kaveri On Wheels Srs.docx	electronic data
8	Noc app flow chart.pdf	electronic data
9	IT initiative-02.08.2025-ATI-new.pptx	electronic data
10	BWSSB Best Practices_25.07.25 2.docx	electronic data
11	Tender_Specifications_Full_Smart_IoT_Borewell_Controller_Final.docx	electronic data
SRWSA		
1	Business_Plan_2022-2026_detail.docx	electronic data
2	Business_Plan_2022-2026_outline.docx	electronic data
3	ផែនការអាជីវកម្មឆ្នាំ២០២២-២០២៦.pdf	electronic data
4	SRWSA's Annual Report 2022.pdf	electronic data
5	SRWSA's Annual Report 2023.pdf	electronic data
6	SRWSA's Annual Report 2024.pdf	electronic data
7	SRWSA's Annual Report 2024_en.docx	electronic data
8	Audit report - internal control 2024.pdf	electronic data
9	Audit report 2022.pdf	electronic data
10	Audit report 2023.pdf	electronic data
11	Audit report 2024.pdf	electronic data
12	Aqua Crew Operation Manual (v2.0) (AQUA Crew)EN.pdf	electronic data
13	Screenshots of Main Screen(WTP1, WTP2, WPT3)	electronic data
14	SCADA System Overview.docx	electronic data
15	Screenshots of Aqua Crew Main Screen_Mapping system.png	electronic data
16	Screenshots of SUMS - DYnamics_NAV2015 Main Screen_Accounting system_Billing system_Stock Asset Mgt.png	electronic data
17	SRWSA Org. Chart_En.pdf	electronic data
18	SRWSA Org. chart_kh.pdf	electronic data
19	WTP3 flow chart.pdf	electronic data
20	WTP3 Drawings (As_built).pdf	electronic data

資料- 5 : 面会者リスト

資料 5 面会者リスト

Ctry.	Org	Dept.	Name
Bengaluru (India)			
	BWSSB	Chief Engineer, Design Section	Mr. Sanath Kumar
		Additional Chief Engineer, MIS & IT	Mr. V.B. Maheswarappa
		Executive Engineer, Design Section	Mr. Chandrasekhar
		Assistant Executive Engineer, MIS	Ms. Lakshmi
		IT Department	Ms. Kavita
		Technical Assistant	Ms. Ashwini
		Executive Engineer, IT Section – Billing & GIS	Ms. Shilpa V.
		Chief Engineer, Project Department	Mr. K.N. Rajiv
		Executive Engineer, IT Section	Ms. Laxmi
		Accounts Section	Mr. Prakash
		Executive Engineer, UFW-II Department	Ms. Nalini
		Additional Chief Engineer, UFW-II Department	Mr. Purushothama BG
	NJS Engineers India Pvt. Ltd.	Director	Mr. Pradipto Sarkar
		Senior Vice President	Mr. Nizamuddin Ahmed
		PMC Representative	Mr. Salauddin
	Chavare Engineering Pvt. Ltd.	GM Automation (System Integrator)	Mr. Sachin Jawale
Seam Reap (Cambodia)			
	MISTI	Under Secretary of State, Ministry Executive	H.E. Khut Vuthiarith
		Office Chief, Office of Technique and Project Management	Mr. Phea Sinat
		Office Chief, Office of Planning and Data Management	Mr. Kong Sovan
		Office Chief, Office of Data Management	Mr. Ly Chansothea
	SRWSA	Director General, Executive Management	H.E. Chan Sengla
		Deputy Director General, Executive Management	Mr. Yay Monirath
		Deputy Director General, Executive Management	Mr. Kot Nimol
		Deputy Director General, Executive Management	Mr. Sok Hout
		Director, Project Management Department	Mr. Pheng Bunhor
		Deputy Director, Project Management Department	Mr. Luon Soknoun
		IT Manager, IT Section (under HR/Admin)	Mr. Somphos Vichhai Chhon
		SCADA Operator, Distribution Department	Mr. Meng Hengkim Lin
		Vice Chief of Office, Distribution Network Management	Mr. Kheav Kimleng
		Deputy Director, Distribution Department	Mr. Horm Sophany
		Accounting Officer, Accounting Department	Ms. Thap Seila
		Chief Accountant, Accounting Department	Ms. Meas Vichana
		Deputy of Commercial Office, Commercial Department	Mr. Sam Senghan
		Water Quality Technician, Water Quality Laboratory	Ms. Seang Ravy
	JICA Cambodia Office	Senior Staff, Country Office	Mr. Munakata Atsushi
		Staff, Country Office	Mr. Seng An Youk

資料- 6 : 現地調査日程および面談記録

資料 6 現地調査行程

1) First site visit (Bengeluru and Siem Reap)

Date	Time	Meeting Topic / Department
23-Jul-25	14:40-15:40	Kick-Off (Cross-departmental)
25-Jul-25	11:00-12:30	Billing System and GIS (IT Section)
25-Jul-25	12:40-14:15	BWSSB's initiatives related to digitalization
25-Jul-25	15:15-16:00	IoT Borewell Monitoring and Kaveri on Wheels (Design Section)
25-Jul-25	16:05-16:30	Current Digitalization Status of BWSSB
26-Jul-25	09:30-14:30	WTPs (Site visit)
28-Jul-25	10:30-12:00	CP-24 Centralized SCADA Integration (PMC Interview)
28-Jul-25	11:50-13:15	MIS, Kaveri on Wheels, GIS and Digital Services (IT Section)
28-Jul-25	13:15-14:45	Financial Systems, WMS, HRMS, ERP (Accounts Section)
28-Jul-25	16:30-17:00	Bulk Flow Meters and NRW Monitoring (UFW-II Department)
29-Jul-25	11:00-13:00	CP-24 Central SCADA System Overview (Central SCADA Centre)
29-Jul-25	13:00-14:00	Detailed SCADA Operations and Visualization (Central SCADA Room)
29-Jul-25	15:45-16:30	NRW Reduction and Digital Monitoring Strategy (UFW-II Department)
30-Jul-25	-	Transfer from India to Cambodia
31-Jul-25	07:50-08:15	SRWSA Kickoff Meeting
31-Jul-25	08:30-09:20	AQUA Crew and IT Section
31-Jul-25	09:20-10:20	Commercial Department
31-Jul-25	10:35-11:30	Accounting Department
31-Jul-25	11:35-12:00	Complaint Management and Others
31-Jul-25	14:30-15:40	Kickoff with MISTI
31-Jul-25	16:15-17:10	SCADA Room at WTP3
1-Aug-25	08:30-10:00	MISTI
1-Aug-25	10:40-11:00	Distribution Department
1-Aug-25	11:30-12:00	Leak Detection Section
1-Aug-25	14:30-15:30	Project Planning & Management Dept.
1-Aug-25	16:10-17:00	SCADA Room at WTP1 & WTP2
4-Aug-25	09:00-10:00	Head of Accounting Department
4-Aug-25	10:00-11:00	Head of Commercial Department
4-Aug-25	11:10-12:00	Accounting Department
4-Aug-25	14:30-	Site Visit - Pipe Construction & Avenza Use (App.)
5-Aug-25	08:30-10:10	AQUA Crew
5-Aug-25	10:10-11:00	Water Supply Dept. (O&M)
5-Aug-25	11:10-11:40	Stock Yard Status
6-Aug-25	14:30-16:00	WTP Monitoring & Site Visit
6-Aug-25	09:40-10:10	Accounting Department
6-Aug-25	11:10-12:10	Meeting - Kitakyushu Water Service (KWS)
6-Aug-25	15:30-16:00	Findings Explanation to SRWSA Management

2) Second site visit (Bengeluru and Siem Reap)

Date	Time	Meeting / Session
27-Oct-25	10:45-11:25	IT section
27-Oct-25	11:30-12:05	IT section
27-Oct-25	12:20-13:10	2nd Meeting: Explanation of 1st Survey Results & Q&A
27-Oct-25	13:20-15:05	IT section
27-Oct-25	15:10-16:00	Accounts Section
28-Oct-25	11:30-12:30	Monitoring Section
28-Oct-25	13:00-13:20	IT section
29-Oct-25	-	Transfer from India to Cambodia
30-Oct-25	09:00-11:30	2nd Meeting: Explanation of 1st Survey Results & Q&A
31-Oct-25	10:00-11:00	Follow-up Discussion with Project Management Director
31-Oct-25	14:30-16:00	Technical Discussion on Proposed Solutions (SCADA & WTPs)
3-Nov-25	8:30-12:00	Wrap-up meeting for the 2nd site visit

資料 6-1 : 第 1 回現地調査 (SRWSA)

1. Meeting Minutes -SRWSA Kickoff meeting

The yellow-colored areas are those where the content could not be fully confirmed.

Date: 07:50-08:15 on July 31, 2025

Location: 3th floor at SRWSA Office

Attendees: JICA Consulting Team

- JICA Consulting Team: Ohno, Ogata, Ohara, and Mr. Piseth (Cambodia)
 - Cambodia side
 - MISTI: 1.
 - 1. H.E. Khut Vuthiarith, Under Secretary of State, 2.
 - Mr. Phea Sinat, Office Chief of Technique and Project Management, 3.
 - 3. Mr. Kong Sovan, Office Chief of Planning and Data Management
 - SRWSA
 - 1. H.E. Chan Sengla, Director General
 - Mr. Yay Monirath, Deputy Director General
 - Mr. Kot Nimol, Deputy Director General
 - Mr. Sok Hout, Deputy Director General 5.
 - Mr. Pheng Bunhor, Director of Project Management Department
 - JICA Cambodia office: Mr. Munakata Atsushi, Mr. Seng An Youk
-
- Mr. Ohno explained the project outline, schedule, and requested items.
 - He confirmed that the SRWSA would be adjusted according to the schedule of the survey team.
 - **The President?** Some SRWSA staff members, including the President, are participating in workshops in other regions, so they are unable to participate in the discussions, but they will make adjustments accordingly.

2. Meeting Minutes (Observation) -AQUA crew and IT section

Date: 08:30-09:20 on July 31, 2025

Location: 2nd floor at SRWSA Office

Attendees: JICA Consulting Team

- JICA Consulting Team: Ohno, Ogata, Ohara, and Mr. Piseth (Cambodia)
- SRWSA: Mr. Bunhor (Director of the Project Management Department), Mr. Luon Soknoun (Deputy of the Project Management Department), Mr. Somphos Vichhai Chhon (IT manager under the Human Resources Department) 1.

1. PCs in AQUA Crew and their usage

- A total of three PCs are available for AQUA Crew use.
 - Two are used by the IT section.
 - One is located on the first floor near the payment counter and is used for new customers who wish to connect. Customers and SRWSA can mutually check the status of the pipe network around their homes. 2.
-

2. information and functions included in the Aqua Crew

- Registration Information:
 - Includes pipe networks, meters, valves, and customer information (water meter locations, contract PDFs, photos, etc.) outside of the water treatment plant.
 - No information on water treatment plants.
 - Input/output function:
 - Various information can be input and output in CSV format.
 - Customer payment status is reflected by manually importing CSV files.
 - Pipe network information is manually updated as needed. 3.
-

3. pipe network calculation and technical requirements

- Pipe network calculations such as flow rate and water pressure for each pipe are available.
 - We understood that water pressure per customer point cannot be checked.
 - Pipe network calculations require a ".inp" format file.
 - A paid service from Geographic is required to create an up-to-date version of this file.
 - The ".inp" file can be exported to Sharp format.
 - In the future, SRWSA intends to make it possible to create the file on its own. 4.
-

Cooperation with other departments

- The O&M department provides maintenance management information such as repairs, leaks, etc. to the ICT section, and the ICT section manually reflects the information in AQUA Crew.
 - No integration with other systems (SUMS) at this time.
 - Inquired with Geographic about the possibility of integration with the SUMS system used by the Accounting section. No response yet.
 - Even if integration is possible, it is expected to be done for a fee.
-

5. other

- All work in the Administration department is done manually.

3. Meeting Minutes (Observation) -Commercial Department

Date: 09:20-10:20 on July 31, 2025

Location: 2nd floor at SRWSA Office

Attendees: JICA Consulting Team

- JICA Consulting Team: Ohno, Ogata, Ohara, and Mr. Piseth (Cambodia)
- SRWSA: Mr. Bunhor (Director of Project Management Department), XXX (Comercial Dep.), XXX (Project Management Department)

1.Synergistic Utilities Management System (SUMS) Overview and Operation Status

- SRWSA has implemented a Synergistic Utilities Management System (SUMS) to manage customer information, billing, and payment data. Customer information is manually entered and updated and used to calculate monthly meter readings and billing amounts; the system supports output in CSV format, but is not linked to AQUA Crew.
- The system is currently maintained by a Malaysian vendor and online support is provided in case of technical problems.
- The basic fee for SUMS is approximately US\$5,000 per year, with fees increasing by 10% each year. Additional modules such as HR, payroll, and customer connectivity will incur additional costs, increasing the annual total to approximately US\$10,000. These modules have been approved by the Board of Directors and a Malaysian vendor will visit SRWSA in 2025 to upgrade the system.

2. meter reading and data entry process

- The meter reading process is manual. The meter reader records the readings on paper at the site and then returns to the office to manually enter the data into the system. Bills are then issued and delivered to the customer's mailbox again.
- Meter readings for the past and current month are recorded monthly, and the amount used is calculated.
- Data is entered into Excel and then uploaded into the system.
- The current process is time-consuming and relies on manual labor, making accuracy and modernization a challenge.

3. constraints on modernization

- Entities recognize that current manual processes are outdated and should be replaced with digital tools such as handheld terminals and mobile apps.
- However, cost is a major obstacle:
 - The cost per handy terminal is around 6,000-7,000 RIR?

- In addition, additional costs are incurred for software apps and compatibility with smartphones.
 - Currently, there are 9 meter readers, and a large investment would be required to deploy terminals to all of them.
-

4. future possibilities

- Handheld terminals that can print invoices locally are considered promising for improving efficiency and reducing response time.
 - The post-COVID financial situation makes it difficult to invest in new technology.
 - The introduction of digital applications is being considered, but implementation has been postponed due to budget constraints.
-

5. fee structure and revenue collection

- Rates vary depending on the type of customer (e.g., commercial customers such as hotels).
 - Means of collection:
 - Cash payment at the counter
 - Bank transfer via mobile app
 - Billing and collection operations are overseen by the Commercial Dep. and involve three departments: Billing Billing (revenue), House connection Household connection, and Customer service Customer service
-

6. billing system and hardware

- The current SUMS system has been in place for over 10 years. It took several minutes to even open billing data.
 - Updates are planned along with new PC hardware. 7.
-

7. licensing and access restrictions

- Simultaneous use of the system is restricted as follows
 - The number of simultaneous users is limited to four (due to licensing restrictions).
 - Since additional licenses are expensive, priority access is given primarily to financial personnel.
 - Depending on the financial situation, the need for expanded access in the future may be considered.
-

8. tax classification and billing structure

- Customers are classified for taxing and billing purposes as follows
 - General residential

- Commercial
 - Public housing
 - Public Institutions
 - The billing system provides a monthly breakdown by service and customer category.
-

9. revenue collection performance

- Revenue collection rates are reported to be very high, over 99%.
 - If a customer fails to pay within 15 days, water service is suspended until payment is received.
 - Strict policies are in place to ensure on-time payment.
 - Customers are notified prior to shutdown.
 - Staff manages approximately 27,000 customers, of which 23,000 are active.
 - Inactive connections are often associated with vacant apartments, etc.
-

10. geographic service area and metering challenges

- The service area includes not only the central city, but also suburban areas about 40 km away.
 - The revenue department has one headquarters office, but meter readers may be affiliated with the commercial department.
 - A separate customer service office handles meter malfunctions and relocations.
-

14. system speed and SUMS updates

- Staff is hopeful that the SUMS update will improve system processing speed and performance.
 - Frequent slowdowns and technical limitations were cited as operational challenges.
-

15. smart meters and pilot projects

- Smart meters for customers are not currently installed.
 - Pilot installations are being considered but have not yet been implemented.
 - Procurement and inter-departmental coordination are identified as challenges.
-

16. handling customer complaints

- Responsibility for handling customer complaints is the responsibility of the Commercial Dep.
- There is an "Information Center" on the first floor of the main building, next to the counter, where customers can file complaints in person.
- Common complaints include the following
 - Undelivered or lost bills
 - Leaking pipes due to road construction
 - Meter malfunctions, etc.

17. recording of complaints and response time

- Complaints are manually logged, compiled in Excel, and shared monthly with the management group on Telegram. The report includes the type of complaint and the status of the response, which is used by the management group to expedite response and interdepartmental coordination.
- Members of the management group include the office director, deputy director, directors of each department, security personnel, and the administrative department (Admin. Dep.). Minor complaints are generally resolved within 5 days to 1 week, and meter relocation and water leakage are handled on the same day whenever possible. In particular, requests for meter relocation are often resolved within 3 days.

Customer Satisfaction and Feedback

- Customer satisfaction is considered high and is evaluated based on feedback from the field.
- In a FS survey conducted by a third-party organization (AFB), customer evaluations were generally favorable.
- However, there is no internal mechanism to systematically measure customer satisfaction.
- The approximate level of satisfaction is estimated based on the number and types of complaints received at the Information Center.

22. main issues identified

- High licensing costs limit system user access
- Meter reading, billing, and complaint handling are all done manually, which is inefficient.
- Budget constraints prevent the installation of equipment such as smart meters and additional SMUS modules
- PCs are outdated and slow, which hinders business operations.
- Lack of real-time linkage between meter reading, billing, and customer information
- Roles of each department are fragmented and lack automation

4. Meeting Minutes (Observation) -Accounting Department

Date: 10:35-11:30 on July 31, 2025

Location: 3rd floor at SRWSA Office (different building)

Attendees: JICA Consulting Team

- JICA Consulting Team: Ohno, Ogata, Ohara, and Mr. Piseth (Cambodia)
- SRWSA: Mr. Bunhor (Director of Project Management Department), Ms. Thap Seila, accounting officer

1. inventory management system (SUMS)

- The system records inventory movements including
 - Opening balances
 - Inflow / stock in
 - Outflow / stock out
 - Ending balance
- Inventory records are supported by the following detailed documentation
 - Purchasing documents
 - Delivery receipts signed by both supplier and purchaser
 - Supplementary documents submitted by the requesting department
- Items such as machinery and equipment and water purification related materials are also recorded in the system.
- Each asset is assigned a control number. 2.

2. asset request and approval workflow

- Each department submits a formal application for the use of materials and assets.
- Applications are approved by the Director General.
- After approval, the transaction is entered into the system.
 - Example: if 5 items are dispatched, the system records 5 dispatches and adjusts the balance.
- A record of outgoing and incoming shipments is maintained.
- All transactions have a written record and are signed and printed for audit and reference.

3. asset classification

- When each department requests an item, it determines whether the item is classified as
 - Assets (e.g., machinery)
 - Consumable inventory
- This classification determines how the item will be handled in the system.

Part 2: Depreciation and Financial Reporting 4.

Calculating Depreciation

- Once an asset is entered into the system, annual depreciation is automatically calculated.
- Depreciation is generated and reported monthly.
 - Example: In June, some assets depreciated over 4,000 units.
- The system can output a detailed report showing the monthly depreciation and the value of the asset after renewal.

5. financial reporting process

- Each month, the finance team prepares a profit and loss statement that summarizes the following
 - Asset value
 - Operating expenses
 - The information is integrated with information from each department to produce a report for the entire organization.
 - The income statement is a simplified format that provides a high level of visibility into the financial status.
 - The organization-wide report reflects the activities of all departments.
-

Part 3: Financial Challenges and System Updates

6. post-COVID financial status and the Charigar project

- SRWSA continues to have financial deficits after 2020 due to COVID-19.
- The start of the WTP3 water treatment plant project will result in a significant increase in the following
 - Depreciation and amortization
 - Power costs (due to 10 km pumping from the lake)
 - Chemical costs (due to the poor quality of the lake water compared to conventional groundwater)
- 6. water rate increases were not sufficient to offset the increased costs

7. gap between production capacity and demand

- Total production capacity of 3 water treatment plants: 90,000 m³/day
- Current usage: ~30,000 m³/day (about 1/3 of capacity)
- Preparatory study for WTP3 was conducted in 2010 and contracted in 2012. Corona has reduced the volume of demand in the Commercial sector. Initially, full operation was expected by 2030, but it is difficult to see demand growing to that level.
- Full operation is expected to be reached around 2042.
- Currently, pipe network expansion is underway to increase the utilization rate of the water treatment plant as much as possible.

8. pipe network expansion plan

- Main objectives of pipe network expansion

- Utilization of unused capacity of water purification plants
- Supply to new residential and industrial areas
- Improve financial sustainability through increased water sales
- **Project 1: 400 km network expansion**
 - Implementation period: 2024-2027 (initially 2024-2026)
 - Financed by government loan
 - Aimed at distributing water to newly developed areas and expanding customer base (Priority will be given to areas with high demand for water supply.)
- **Project 2 (AFD support): 200 km network expansion**
 - Scheduled implementation: 2027-2029
 - Currently in planning stage
- **Expansion to be funded by SRWSA's internal budget:**
 - Continuous small-scale expansion of 10-20 km per year Purpose of expansion

5. Meeting Minutes (Observation) -Complain management and others

Date: 11:35-12:00 on July 31, 2025

Location: 1st floor at SRWSA Office

Attendees: JICA Consulting Team

- JICA Consulting Team: Ohno, Ogata, Ohara, and Mr. Piseth (Cambodia)
- SRWSA: Mr. Bunhor (Director of Project Management Department), Ms. XXX (Customer section)

1. reporting categories and customer registration

- The meeting began with a discussion on the reporting structure of water utility operations:
 - A total of 28 complaint categories are managed.
 - Reports are categorized into two types
 - Direct reports at the customer desk at the headquarters:
 - The most common inquiry is "lost invoice", followed by "payment after new connection" and "water disconnection during repair work".
 - Hotline (telephone inquiries):
 - The most common inquiry is about "lost invoice".
 - 30% of customers make payments over the counter and 70% make payments through the mobile app.
 - Customers can view their water bills by entering their ID on a designated mobile app.
 - The app links billing information to the customer's bank account and displays the amount due in real time.
-

2. complaint response process

- When a customer files a complaint (inquiry):
 - Staff first handwrites a record of the complaint.
 - Depending on the nature of the complaint, it is forwarded to the appropriate department.
 - All complaints are recorded in an Excel spreadsheet.
 - For each complaint, a manual check is made to see if it has been resolved.
 - For technical issues and repair complaints:
 - Information is shared with the repair team via group communication tools.
 - When repairs are completed, feedback and completion reports are returned to the Customer section by the responsible team.
-

3. water source and access issues

- The water intake point is located approximately 10 kilometers from a nearby lake.
- During the rainy season, access is severely restricted due to flooding:

- The access road is submerged, making vehicular access impossible.
 - Especially in September, when the water level is high, it can only be reached by boat.
- These seasonal conditions present a major logistical challenge for maintenance operations.

6. Meeting Minutes (Observation)-Kickoff with MISTI

Date: 14:30-15:40 on July 31, 2025

Location: 3rd floor at SRWSA Office

Attendees: SRWSA

SRWSA: 1.

1. H.E. Chan Sengla, Director General

Mr. Yay Monirath, Deputy Director General

Mr. Kot Nimol, Deputy Director General

Mr. Sok Hout, Deputy Director General

Mr. Pheng Bunhor, Director of the Project Management Department

MISTI: 1.

H.E. Khut Vuthiarith, Under Secretary of State

Mr. Phea Sinat, Office Chief of Technique and Project Management

Mr. Kong Sovan, Office Chief of Planning and Data Management

JICA Cambodia office: 1.

Mr. Munakata Atsushi

Mr. Seng An Youk

JICA Expert Team and National Assistant: 1.

Mr. Atsuo Ohno

Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Srorn Piseth

Opening Remarks

Mr. Kut Boutiarit, Undersecretary, MISTI

- **Mr. Kut Boutiarit expressed his appreciation for JICA's long-term support to Cambodia's water supply sector, especially the grant assistance for the Siem Reap Water Supply Project in 2006 and the scholarship support for capacity building of SRWSA staff.**
- **He noted that JICA plays an important role not only in physical infrastructure but also in human resource development.**
- **He stressed the importance of integrating SCADA and other smart systems across different projects.**
- **Referring to his experience in visiting Japan in 1995, he expressed his deep respect for JICA's**

support over the years.

- **Noting that** many existing systems **are only utilizing about 10% of their original capacity**, he stated that integrating systems could greatly improve overall effectiveness.
-

3. main points of discussion

3.1 System Integration and Digital Transformation (DX)

- Undersecretary Boutiarit emphasized the following
 - The importance of designing systems that match the capabilities of staff (especially to be able to analyze and operate on data).
 - The goal is to improve operational efficiency and fiscal sustainability.
 - Digital government and technology-based services need to be prioritized.
 - The JICA-supported integrated management and monitoring system of PPWSA (Phnom Penh Water Supply Authority) was cited as a good example.
 - Systems operated by private operators should also be able to be expanded by public agencies in the future.
 - He emphasized that JICA's support is valuable in "teaching people how to fish" rather than "giving them fish."

3.2 Business-Oriented Management

- Undersecretary Boutiarit stated that
 - Water services should be viewed as a business and should be profitable. Profit is essential for reinvestment and business sustainability.
 - Increased efficiency, use of data, and rapid response are priorities.
 - Real-time data such as telemetering systems, flow rates, and water pressure are essential.
 - It must be accompanied by not only the installation of the system but also the training of human resources capable of utilizing it.
-

4. comments from JICA and the expert team

Mr. Atsuo Ohno (JICA expert team)

- Reaffirmed that MISTI's policy and the direction of the JICA expert team are in agreement.
- He reiterated the importance of human resource development, not tools.
- He confirmed that field surveys are being conducted in Cambodia and India to assess the digital maturity level of each country and to prepare DX architecture proposals.

Mr. Atsushi Munakata (JICA Cambodia Office)

- expressed JICA's sincere commitment to continue its cooperative relationship with MISTI and SRWSA.
- He stated that DX and human resource development will play an important role in future

cooperation.

5. technical capacity and challenges

SRWSA Representative

- Explained the limitations of the current technical staff:
 - For example, the AQUA Crew system is operated by only three trained personnel.
 - More personnel are needed to fully utilize the digital system.
- He emphasized that sustainable staffing is essential for the continuous operation of the digital system.

JICA Expert Team (Mr. Ohno and Mr. Pisses)

- confirmed that the project team plans to assess current capacity and infrastructure.
- Through the study, the team will determine if SRWSA can properly operate the smart meter and telemetering system.
- Based on the survey results, the team will consider appropriate support measures for integration and capacity support.

6. Question and Answer Session

6.1 Smart Meter Pilot Project and its Feasibility

- Referring to the term "pilot project," Undersecretary Boutiarit asked whether JICA's implementation support would include the actual installation of smart meters.
- In addition, he mentioned the "Phnom Penh ICT-based Smart Water Management System" being implemented by K-water (Korea Water Resources Corporation) from 2025 to 2027, with Greentech Inc. as a partner. ***
- JICA Cambodia Office (Mr. Seng Ang Yuk) responded as follows:
 - If SRWSA already has smart meters, the support may include the provision of technical training by the JICA expert team.
 - If smart meters have not yet been installed, the location and quantity required for installation may be considered.
 - Based on the results of the survey, future support details will be considered.

6.2 Consistency of technology and staff responsiveness

- Undersecretary Butiarit pointed out:
 - Technology must be aligned with staff competencies, especially in data analysis and system control.
 - Capacity building is not optional, but essential.
- JICA expert team view:
 - Without skilled personnel, the tool will not be effective.
 - Capacity building is a core element of this project.

7. future dx strategies and priorities

7.1 Focus on Business Model

- **Undersecretary Butiarit commented:**
 - **Water utilities need to operate as businesses in a sustainable manner.**
 - **Especially in PPPs (public-private partnerships), profits will be the source of reinvestment and debt repayment.**
 - **Operational improvements and the introduction of digital tools need to result in clear efficiency gains.**
-

10. final findings

- **Both parties shared their perceptions on the following points**
 - **The alignment of digital tools with the competencies of operational personnel is crucial.**
 - **That SRWSA has shown a positive attitude toward new technologies and human resource development.**
 - **The importance of future discussions and technical collaboration.**
- **Future steps:**
 - **The JICA expert team will complete the digital maturity assessment and system architecture proposal.**
 - **SRWSA will review the proposed framework presented by the study team in October 2025.**

***Installing smart meters in pilot areas in Phon Pnem (Korea)

https://www.kwater.or.kr/eng/busi/overseas/overseas17Page.do?s_mid=2263

https://construction-property.com/korea-to-support-cambodia-equip-the-smart-water-management-technology-in-phnom-penh/?utm_source=chatgpt.com

https://greentechinc.co.kr/en/sub3-tab6/?utm_source=chatgpt.com

https://www.khmertimeskh.com/501122332/cambodia-south-korean-firm-discuss-smart-water-technology-cooperation/?utm_source=chatgpt.com

7. Meeting Minutes (Observation) -SCADA Room at WTP3

Date: 16:15-17:10 on July 31, 2025

Location: WTP3

Attendees: 1.

SCADA System and Water Treatment Plant Operation

- **Water Intake Facility (Intake)**
 - There are two pipelines, but only one is currently in use.
 - Currently **only 15% of the** intake capacity is in use, and the following issues arise due to low flow and velocity:
 - Sedimentation is likely to occur.
 - Fish carcasses in the pipes cause odors, which affect the raw water.
 - As a result, the water purification process is time-consuming.
 - Intake **is manually operated by a local operator who operates the switch (not remotely controlled by SCADA)**. After that, automatic control by VFD.
- **Flocculation and sedimentation treatment**
 - No sensors are installed for Flocculation and Sedimentation.
- **Filtration system**
 - Of the total of 6 filters, only 3 are currently in use.
 - The operation of the other three filters is switched alternately on a monthly basis.
- **Water pumps**
 - There are five pumps for transporting water from the water purification pond, but currently only one is in use.
- **SCADA System**
 - Equipment in the water purification plant can be monitored and controlled by the SCADA system.
 - The system is operated by comparing water quality sensor data with the results of analysis at the water quality laboratory.
 - The status of WTP1 and WTP2 can also be monitored in real time from WTP3. **What items? Not controllable?**
- **Chlorine and Lime injection**
 - As designed, Chlorine and Lime injection rates are manually adjusted.
- **Water Distribution Zones and Non-Revenue Water Management**
 - There are a total of 7 water distribution zones, with Inlet Bulk Meter at the entrance of each zone.
 - Water pressure and flow rate for each Bulk Meter can be monitored in real time on the

SCADA system.

- Difference between inlet (supply) and outlet (usage) can be calculated by comparing with the water meter usage for each house. Manual operation. Currently, smart meters have not been installed and fully automatic monitoring is not possible. 2.
-

2. operation of water quality testing laboratory

- **Inspection frequency and items**
 - Water quality inspections are conducted every 2 hours (8 items).
 - Water is sampled at designated points in the water treatment plant and compared with sensor data.
 - Algae are inspected about 3 times a month.
 - Detailed inspections are conducted on 18 items on a monthly basis.
 - E.coli is also inspected in the Biological Room.
- **Records and Data Management**
 - Inspection results are handwritten on a designated form.
 - The data is then organized and saved in Excel.
 - The data is managed as one file per year.
 - The system is not linked to any other system.
- **Issues in the dry season**
 - Turbidity tends to increase during the dry season.
 - The design value is 500 NTU, but it can reach nearly 700 NTU, and in 2024, it exceeded 1,000 NTU on some days.
 - The increase in turbidity is directly related to the increase in the cost of water treatment.

8. Meeting Minutes (Observation) -MISTI

Date: 08:30-10:00 on Aug 1, 2025

Location: : 3rd floor at SRWSA Office

Attendees: : MISTI: : 3rd floor at SRWSA Office

MISTI: 1.

1. H.E. Khut Vuthiarith, Under Secretary of State

Mr. Phea Sinat, Office Chief of Technique and Project Management

Mr. Kong Sovan, Office Chief of Planning and Data Management

SRWSA

Mr. Pheng Bunhor, Director of the Project Management Department

JICA Cambodia office: 1.

Mr. Munakata Atsushi

Mr. Seng An Youk

JICA Expert Team and National Assistant: 1.

Mr. Atsuo Ohno

Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Srorn Piseth

1. MISTI's Efforts in Digital Transformation (DX)

- MISTI explained that while they recognize the importance of DX in the water supply sector, they do not currently have a department dedicated to DX or IT.
- All data from public water utilities is managed by a single team within MISTI, and there is no dedicated DX team.
- MISTI is currently in the process of starting to develop a DX strategy to improve operations, mainly for public water utilities.
- DX promotion requires cooperation with external donors such as JICA and ADB, and collaboration with the private sector is not envisioned at this time due to challenges of regulatory compliance and lack of capacity.
- Establishment of sustainable and quality water supply is a key issue for MISTI, and currently DX implementation is not progressing due to lack of budget.

2. KPI and monitoring system

- Mr. Ohno asked whether there are any KPIs (Key Performance Indicators) related to DX and the possibility of developing them.
- Director Futuaris responded that KPIs for general water utilities exist, but KPIs specific to DX have not yet been established.
- There are quarterly board meetings with 11 public water utilities, during which KPI data is collected.
- All KPI data is centrally managed by MISTI and is usually consolidated in June.
- JICA expressed its willingness to discuss future KPI formulation with MISTI and consider supporting the establishment of DX-related KPIs.

3. comparison of public and private water utilities and challenges

- According to MISTI, cooperation with public water utilities is relatively smooth and institutionally organized, but cooperation with private entities is fraught with difficulties.
- There are approximately 450 private water utilities in Cambodia.
- About 90% of private operators are not able to ensure water quality that complies with national standards.
- Many private companies prioritize profit and have inadequate service quality and responsibility systems.
- Some private operators may temporarily meet standards, but fail to ensure continuous water quality.
- MISTI is in the process of developing a legal and institutional framework to classify and regulate private operators in a phased manner through a licensing system.
- The states, in cooperation with MISTI, are also in the process of strengthening their systems for supervising local private operators.
- It is MISTI's policy to prohibit unauthorized operators from operating under its authority.
- MISTI is currently collecting and organizing detailed information on private water utilities and plans to develop appropriate regulatory approaches based on this information.

4. regulatory policy and strategic vision

- MISTI's long-term goal is to establish institutional controls over both public and private entities to ensure sustainable service delivery.
 - Public entities are seen as role models for private entities and are expected to continue to serve as model cases.
 - Publicly-owned entities are required to submit master plans and service expansion schedules in line with the SDGs (Sustainable Development Goals).
 - MISTI aims to expand publicly owned service coverage to 60-70%.
 - It was emphasized that achieving the water-related targets of the SDGs is not a small-scale effort that can be completed within five years, but a medium- to long-term challenge.
-

5. expectations for Japanese companies

- **Mr. Ogata (TEC) asked about expectations for Japanese companies in Cambodia's water supply sector.**
- **Mr. Htuari expressed his high evaluation of Japanese companies' technical capabilities, efficiency, and quality control.**
- **SOMA Construction & Development Co., Ltd. was introduced as a good example of a joint project with the government on water supply .**
- **What is expected of Japanese companies?**
 - **Introduction of energy-saving technology**
 - **High-performance equipment and systems**
 - **Highly transparent business operations**
 - **Provide sustainable solutions from a long-term perspective**
- **Some European (especially French) companies have already developed joint ventures, and Japanese companies were also considered to have high potential for participation.**
- **Marubeni's plan to expand coverage to 3,000 points nationwide by 2035 (deployment by six private operators) was also introduced.**
- **JICA, for its part, indicated that it intends to position the efforts of public entities as a role model for private entities. 6.**

6. History of SRWSA (Siem Reap Water Supply Authority)

- **A feasibility study (FS) was conducted in 2010 and a re-FS in 2011, covering the following four water sources**
 - 1. Siem Reap River**
 - 2. Groundwater**
 - 3. Balay Reservoir**
 - 4. Tonle Sap Lake (final selection)**
- **With JICA support, an 8,000 m³/day water treatment plant and a 40 km water distribution network were established in 2006.**
- **By 2019, the supply capacity will be expanded to 15,000 m³/day.**
- **In the past, water supply reached only a limited area along Route 6, but service is now being expanded to the west side of the city.**
- **However, households generally use water storage tanks, and the mismatch between intermittent water supply and demand remains an issue. 7.**

7. current status and future demand outlook

- **When the operation of a water treatment plant reaches 80%, it is considered to be practically operating at full capacity of the facility.**
- **Water demand by 2030 is expected to exceed the current supply capacity.**

- Water use by hotels and commercial facilities is high and already exceeds historical projections.
- Network expansion to urban and surrounding areas is urgently needed.
- JICA's Master Plan, developed in 2011, was based on the demand at that time, but needs to be updated to accommodate the current urbanization and tourism development.

8. investment needs and plans

- It is estimated that approximately US\$15 million in investment is needed to expand the water supply network.
- Further construction of water treatment plants and extension of distribution pipes will be required to meet the increasing demand and stable supply.
- In order to reduce dependence on Tonle Sap Lake, development of new water sources is also being considered.

9. MISTI's Final Opinion and Strategic Direction

- Secretary Htuaris stressed that achieving the water sector of the SDGs (Sustainable Development Goals) will be difficult in the short term and is not a small task that can be completed within 5 years.
- SRWSA (Siem Reap Water Supply Authority) has made significant progress so far in improving intermittent supply and expanding its network, but more work is needed to ensure reliable service throughout the region.
- MISTI aims to achieve responsible water services within a national strategy that integrates both private and public entities.
- Ensuring water quality by private entities is a particularly urgent issue, and it was noted that while some providers temporarily meet standards, approximately 90% of all providers do not meet standards on a permanent basis.

10. strengthening regulation and governance of private water utilities

- MISTI has the legal authority to issue licenses to and regulate private operators.
- It is in the process of classifying, monitoring, and gradually strengthening regulations for approximately 450 private entities in Cambodia.
- Many private entities lack the technical skills, knowledge, and sense of responsibility to reach standards on their own.
- MISTI intends to provide training and support to private entities to strengthen their capacity in a phased manner while strengthening regulations.
- Each state government, in cooperation with MISTI, will be responsible for supervising local private entities.
- Coordination with private operators remains difficult due to the scale, decentralization, and lack of a monitoring system.

11. water demand forecasting and system efficiency

- The current water treatment plant is **already operating at 80%**, which is effectively considered full

capacity.

- There is a gap between actual production and measured data, highlighting the inadequacy of water supply efficiency and analytical capacity.
- Households use rooftop water storage tanks, and the mismatch with intermittent supply makes it difficult to coordinate supply and demand.
- There are peaks in the early morning and evening hours of the day, and a decrease in water pressure during these hours is clearly observed.
- The survey and master plan conducted by JICA from 2008-2013 remains valid, but needs to be reviewed as the recent expansion of urban development and tourism has resulted in consumption exceeding projections.

12. cooperation and future collaboration with Japan

- MISTI expressed its deep appreciation for JICA's support over the years. In particular, cooperation in infrastructure development and human resource development was highly appreciated.
- MISTI hopes to continue cooperation in the following areas
 - Expansion of water supply infrastructure
 - DX implementation and modernization of IT systems
 - Training for public and private entities
 - Introduction of advanced technology by Japanese companies
- The Cambodian government welcomes responsible foreign investment in the water supply sector, and Japanese companies are expected to be long-term and reliable partners.

9. Meeting Minutes (Observation) -Distribution Dep.

Date: 10:40-11:00 on Aug1, 2025

Location: 3rd floor at SRWSA Office

Attendees: SRWSA

SRWSA: 1.

1. Mr. Meng Hengkim Lin, SCADA operator

Mr. Luon Soknoun, Deputy of the Project Management Department

Mr. Kheav Kimleng, Voice Chief of Office (Distribution Network Management) 4.

Mr. Pheng Bunhor, Director of the Project Management Department 5.

Mr. KOT Nimol, Deputy Director of the General

Mr. HORM Sophany, Deputy Director of the Department.

JICA Expert Team and National Assistant: 1.

Mr. Atsuo Ohno

Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Srorn Piseth

Definition and Current Status of Non-Revenue Water (NRW)

- **Definition of NRW:**
Water produced - Water sold (water billed)" = Non-Revenue Water (NRW)
- **There is no automated calculation system, and everything is handled manually.**
- **The only digital system is SCADA, and there is no DX (Digital Transformation) related implementation. 2.**

Organizational Structure and Main Tasks

- **The NRW division belongs to the Water Supply Bureau, which is the largest in the organization.**
- **Seven main operations:**
 1. **Water production and supply (also covers water treatment plants)**
 2. **Operation and maintenance (O&M) of water treatment plants**
 3. **Maintenance of the water distribution network**
 4. **NRW reduction activities**
 5. **Mechanical management**
 6. **Piping installation**
 7. **Regional office operations, including**
 - **Water treatment plants (3 locations)**

- Mechanical and electrical offices (including repairs)
 - Piping installation offices
 - Water Distribution Office (including leak detection and maintenance)
 - Mechanical Installation Office
 - Detailed organization chart will be provided separately. 3.
-

3. efforts to reduce NRW

Network development and maintenance

- Almost all water distribution pipes were installed within the past 20 years, although some are more than 30 years old.
- Pipe installation is done according to Standard Operating Procedures (SOPs).
- When a leak is reported, response begins within one hour.

Leak Detection Team

- 16-member team (8 maintenance personnel + 8 leak detection personnel)
- Daily leak detection. Equipment used:
 - Hearing sticks (used at night)
 - Underground leak detector
 - Visual inspection
- After responding to a leak, a leak report is sent to the GIS staff, and the leak location is recorded on a GIS map.
- Communication is by telephone and telegram.
- The water distribution office is located in the main building.
- About 40 leaks are detected each month.

Pressure Management

- Pressure is maintained at approximately 3 bar.
 - Manual valve operation for repairs.
 - The pressure of the water distribution pumps can be adjusted in the SCADA room, but the valves are operated manually.
 - Opening and closing of Valves in the field is only possible for new connections or repairs.
-

4. SCADA and current monitoring system

- SCADA is in operation at the following
 - Water Treatment Plant (WTP): monitoring pressure and flow rate
 - Water distribution zone entrances: flow meters at each of the 7 zone entrances
- Two outlet meters at WTP1, one at WTP2, and one at WTP3
- Monitoring within the water distribution network is not yet implemented. A site visit is required.

- SCADA has not yet been linked to GIS or AQUA Crew
-

5. use of GIS and AQUA Crew

- Record and share leak locations and repair information on GIS.
 - Using AQUA Crew and Avenza, the following functions are also available on smartphones:
 - Display of piping diagrams
 - Visualization of repair points and valve locations
 - Utilized to plan and coordinate field work.
-

7. meter management and illegal connection measures

- Customer meters: 27,000
 - Meter renewal cycle: 8-10 years
 - Meters with an error of 3% or more are replaced. Average of 20 meters renewed per month (5 this month).
 - Check items:
 - Differences between actual measurements and records
 - Meter failure or backflow
 - Signs of illegal connections, etc.
-

8. water distribution zone configuration and valve operation

- The seven water distribution zones are hydraulically independent.
 - There are valves at the boundaries between zones (normally closed).
 - Valves are opened and zones connected only in case of emergency.
 - Water flow and pressure management is mainly manual operation.
 - As the SRWSA water distribution area has expanded, there are plans to distribute water outside of the existing zones.
-

9. reduction of illegal connections and countermeasures

- Seven years ago, there were many illegal connections.
 - Main measures:
 - Replacement of PVC pipes (less than 1 bar) with PE pipes (3 bar)
 - Increased penalties
 - Immediate disconnection of illegal connections
 - Regular patrols and detection
-

10. Meeting Minutes (Observation)-Leak detection section.

Date: 11:30-12:00 on Aug1, 2025

Location: SRWSA Office

Attendees: SRWSA

SRWSA: 1 Mr. Pheng Bunhor, Director of the Project

1 Mr. Pheng Bunhor, Director of the Project Management Department

Mr. Kheav Kimleng (Leak detection section)

JICA Expert Team and National Assistant: 1.

1 Mr. Atsuo Ohno

2. Mr. Koichi Ogata

3. Mr. Ohara Yu

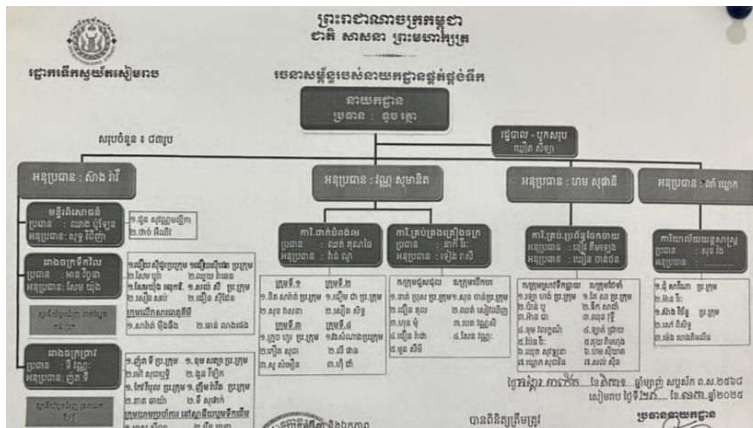
Mr. Srorn Piseth

1. overview of the water supply system

- The local water supply system was first established in 1930 with the support of the French government.
- Full-scale expansion began around 2004, and especially since 2017, rapid progress has been made with the support of JICA and ADB.
- Currently, about 99% of the pipes are about 20 years old, and projects to expand the network are ongoing.

Organizational Structure and Related Departments

- Water supply Dep. is organized as follows (see photo):
 - Production
 - Pipe installation
 - Distribution and network management
 - Mechanical



- The Water Supply Dep. is divided into 16 groups, each with 2 team leaders. They monitor, repair, and install new pipes. 3.

3. leak detection policy

- The main target of leakage investigation is the water distribution main
- Correlative leak detectors are installed inside valves or on walls, etc., and are operated at night (midnight to 7:00 a.m.) to detect leaks while ambient noise is low.
- Based on an annual plan, all water distribution pipe networks are inspected once a year.
- In addition to this periodic inspection, surveys are also conducted as needed.

4. prioritization based on data

- Prioritization of detection areas is based on the following information
 - Monitoring data from the SCADA system
 - Minimum Night Flow (MNF) analysis
 - Age of piping installed
 - As-built drawings and repair history
- Identification of areas at high risk of leakage based on MNF anomalies; leaks from PVC pipes and water pipes are common.
- Prior to field survey, target areas are selected in the office and routes are clarified before dispatching to the site.

5. capacity building and external support

- Skills related to leakage survey were acquired through the following JICA support and other sources:
 - 2015: JICA technical cooperation project (provision of detection equipment and database construction)
 - 2023: Participation in training in Nagoya (practical training on non-revenue water control and acoustic leak detection methods)
- These collaborations have strengthened the technical skills of the field staff and are the foundation

of the current survey system.

6. maintenance and warehouse operations

- Multiple warehouses are operated to store the following equipment and parts
 - Leak detectors
 - Water meter and fitting parts
 - Emergency repair parts
- Approximately 40 units of spare equipment are always available, and the company maintains a system that can be used on weekends (Saturdays and Sundays).
- The company maintains a maintenance system capable of handling both periodic inspections and emergency repairs.

7. old infrastructure and stockpiling facilities

- Some old infrastructure and equipment from the 1930s and 1960s have been preserved, and traces of the early French-style water supply system still remain.
- Some of the old equipment is stored in a warehouse as backup and technical documentation, but is not used in the current system.

11. Meeting Minutes (Observation) - Project Planning and Management Department

Date: 14:30-15:30 on Aug1, 2025

Location: SRWSA Office

Attendees: SRWSA

SRWSA: 1 Mr. Pheng Bunhor

1 Mr. Pheng Bunhor, Director of the Project Management Department

JICA Expert Team and National Assistant: 1.

1. Mr. Atsuo Ohno

2. Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Srorn Piseth

Water Supply System Expansion Project

a. WTP (Phase 1, 2 and 3) and Water Distribution Pipe Network Expansion (JICA Financed)

- The project to expand the water purification plant (already constructed and in operation) and water distribution pipelines is ongoing.
- An additional 20 km of water pipeline will be constructed using the balance of the existing JICA loan.
- Construction has already begun, with 9-10 km completed by the contractor.
- Overall completion is scheduled for early next year.

b. 400km water pipeline expansion project (Cambodian government funded)

- Funding by the Government of Cambodia: US\$23 million.
- Description: Installation of 400km of water pipeline around the SRWSA service area.
- Period: Originally planned for 2024-2026, but delayed. The new period is September 2024-2027.
- Priority is based on population density, starting with areas with the highest number of users.

c. AFD (French Development Agency) funded expansion project (2027-2029)

- Description: Installation of 200 km of water distribution pipes.
- Budget: €30 million (€25 million loan + €5 million EU grant).
- 25,000 household connection components (meters, etc.) for poor households will also be provided.
- Feasibility study (FS) completed.
- Hydraulic analysis is ongoing.
- AFD is responsible for the following FS components
 - Socio-economic survey: complete
 - Financial Study: Completed
 - Technical and environmental study: consultant selection in progress
 - The FS will be funded by an AFD grant of 23,000 EUR and an additional 200,000 EUR.

d. Master Plan and New JICA Projects (2025-2040)

- A new JICA mission is scheduled to visit in November to develop a master plan for 2025-2040.
 - Study details:
 - Comprehensive master plan development
 - Implementation of FS on priority projects in the plan
 - Study on water source reliability, population coverage, and fund consistency
-

2. water purification plant (WTP) capacity

- Current water treatment plant capacity: 90,000 m³/day
 - Current production: approx. 30,000 m³/day
 - Expansion will focus on expanding the water distribution network to utilize unused capacity and attract new customers
-

3. smart meters and NRW (non-revenue water) management

a. Introduction of smart meters

- Mechanical (conventional) meters are currently in use.
- Smart meters are recognized as effective for leak detection and NRW monitoring.
- According to examples from other countries, each unit costs about US\$100 (Ohno pointed out).
- However, financial constraints make immediate introduction difficult.

b. NRW monitoring (current method)

- An integrated digital NRW monitoring system has not yet been introduced.
 - Currently, flow rates are measured by mechanical meters at the following locations
 - Water intake points
 - Each zone
 - Customer meters
 - Leakage is calculated manually by comparing the total inflow to the zone with the total customer usage.
-

4. loan repayment and financial challenges

- SRWSA has received loans from ADB, JICA, and AFD.
 - Principal repayment officially begins in 2022.
 - Due to financial constraints, a 3-year repayment moratorium is requested.
 - With the government's permission, the start of repayment was postponed to 2028.
 - Financial situation remains difficult, making new investments in smart meters, etc. difficult.
-

5. connection costs and equipment procurement

- **New connection costs for customers: approx. 595,000 Riel (approx. US\$150)**
 - **This includes**
 - **Water meter (approx. 140,000 Riel / US\$35-75, made in Malaysia)**
 - **Piping, fittings, and installation costs**
- **Free connection and material costs for poor households through AFD and other donor programs.**
- **25,000 connections planned through AFD subsidies.**

6. digitalization and IT system

a. Current IT structure

- **IT department will be newly established in 2022 or 2023.**
- **Deployment:**
 - **2 IT staff under HR/Administration**
 - **2 GIS staff under the project planning department**
 - **Total of 4 people working on digitalization promotion**
- **The GIS team will utilize Aqua Crew and will also receive training in Japan (2 GIS staff + 1 IT staff requested, of which only 2 accepted).**

b. System usage and challenges

- **Aqua Crew is used for GIS mapping and data analysis, including pipe networks and customer locations.**
- **Data is manually entered and utilized by planners.**
- **Digital system integration is limited; SCADA and automatic meter reading have not yet been implemented.**
- **SARMIS (asset ledger management information system) is a unified national platform:**
 - **Mandatory asset registration for buildings, infrastructure, water and power facilities, furniture, etc.**
 - **No integration with SRWSA's internal system.**
 - **System access is restricted and server management is by the central government.**
 - **Obligation to comply according to guidelines from the Ministry of Economy and Finance.**

7.

7. organization and management structure

- **HR/Administrative Department**
 - **Responsible for human resource management of IT and administrative staff**
 - **Manages the assignment of personnel in charge of digitalization**
- **Project Management Department**
 - **Responsible for GIS-based planning, Aqua Crew operations, and data analysis**

8. socioeconomic and transfer-related issues

a. Customer connectivity and billing

- SRWSA reports that:
 - Total connections: 27,000
 - Actual billable (active) connections: 23,000
 - Approximately 4,000 are unbilled (inactive or informal connections)
- Some households use shallow wells due to misunderstanding that "water is free" or to avoid paying the fee.
- Awareness-raising and publicity activities are needed to promote formal connection (Mr. Bunhor).

b. Shallow well use and health risks

- Despite health risks, shallow wells continue to be used in some areas because they are free.
- SRWSA aims to raise awareness about water contamination risks.

c. Resettlement Projects

- Government-initiated resettlement affects the client base.
- Relocation from high-density areas to new settlements is underway.
- Demand for water service in new settlements is unclear.
- SRWSA working with government agencies to address asset registration and future service delivery.

9. digitalization vision and future strategies

- Digitalization is identified as a priority in terms of
 - Leak detection (however, currently, many pipes are damaged due to road construction. Leakage is not due to aging)
 - Non-revenue water (NRW) reduction
 - Billing and customer management
- SRWSA hopes to implement smart meters and integrated monitoring dashboards in the future.
- Financial constraints and lack of IT human resources are the main bottlenecks.
- Possible donor support and pilot implementation from Japan and other donors are being considered.

10. funding and budget status

- SRWSA confirmed that all ongoing projects (JICA piping, government funded 400km, AFD expansion) have been budgeted.
- Future pipeline expansions will also be internally funded.
- SRWSA is aiming for all residents to have access to water supply by 2030, but this is expected to be difficult to achieve.

12. Meeting Minutes (Observation) -SCADA Room at WTP1 and 2

Date: 16:10-17:00 on Aug1, 2025

Location: SCADA Room at WTP 1 and 2

Attendees: SRWSA

SRWSA: 1 Mr. Pheng Bunhor

1 Mr. Pheng Bunhor, Director of the Project Management Department

2 Mr. XXX, young person who always explains details to us

JICA Expert Team and National Assistant: 1.

1 Mr. Atsuo Ohno

Mr. Koichi Ogata

3. Mr. Ohara Yu 4.

Mr. Srorn Piseth

1. Facility Overview

- There are two water treatment plants in this facility:
 - WTP 1: Constructed in 2006 (groundwater source)
 - WTP 2: Constructed in 2019 (surface water source) 2.

2. pumping equipment and control system

- WTP 1 has eight deep well pumps that can be remotely controlled through SCADA.
 - Each pump has an individual control panel and is connected through a PLC system.
 - LED indicators on the panel: red (running), green (standby), and yellow (alarm).
- Eight additional pumps installed by SRWSA are not connected to SCADA and require manual operation on-site; SCADA also does not show the eight additional pumps.
- Some older pumps have remote control failures and require troubleshooting. 3.

3. water intake and filtration system configuration

- Water from all pumps is delivered to a common receiving well through two intake pipes equipped with flow meters.
- Water is sent to an existing coagulation and filtration unit (3 ponds).
- Water is sent to a newly constructed filtration unit installed by SRWSA on its own (2 ponds).
- The treatment capacity of the facility was initially 8,000 m³/day and was increased to 15,000 in 2013-2015. 4.

4. filtration system and control

- There are currently 5 sand filtration ponds, but only the initial pond is shown on SCADA (the additional 2 ponds are not shown).

- Backwashing is automatically performed every 24 hours by PLC timer control, but remote control is not possible.

- The filtration system can be switched manually/automatically on site, but requires a worker's presence for adjustment.

5. dosing system

- Lime and chlorine dosing system:
 - Status can be checked on SCADA screen.
 - Remote operation is not possible. Manual operation on site is required.
 - Start/stop of dosing pumps is manual.

6. functions and limitations of SCADA

- SCADA is mainly used for the following
 - Status and alarm monitoring.
 - Visualization of flow, pressure, water level, and tank status.
- Many alarms and events are record only and cannot be controlled via SCADA.

7. water distribution and pressure management

- Water distribution pumps:
 - Operates with simple manual start/stop operation; no VFD (variable frequency drive) installed.
 - Automatic adjustment of pressure and flow rate is not possible.
- Due to the old equipment, this water treatment plant is currently used primarily for "water production" only and not for "water distribution". The purified water is sent to the water treatment pond at WTP2 and distributed from WTP2.
- WTP1 has only one PLC.

8. issues related to operation of two water treatment plants

- The operation of two water treatment plants within the same water distribution system poses the following issues
 - Different pump capacities and pressure requirements for each water treatment plant (e.g., 4.5 bar for one and less for the other).
 - It is difficult to control pressure at both water treatment plants at the same time, which may lead to system instability.
- Current operational policy:
 - One water treatment plant is operated at a fixed pressure with manual settings.
 - The other is dynamically adjusted according to the flow rate.
 - Due to the difference in sensors, valves, and pump outputs, it is our opinion that both water treatment plants should be operated with independent control systems.

9. SCADA server-client configuration and limitations

- **SCADA is a server-client system:**
 - The main server is in operation.
 - The client terminal is out of order and simultaneous operation by multiple users is not possible.
- **Countermeasures:**
 - Workers access SCADA using Microsoft Remote Desktop.
 - However, only one user can operate the system, and other users are disconnected upon connection.
 - This method is inefficient and unsuitable for emergency response.
- Control is performed by only one central PLC, which is connected to the remote I/O unit via optical fiber.
- It is possible to monitor WTP2 from WTP1, but it is not possible to monitor the status of WTP1 from WTP2.

10. water quality monitoring and sensor status

- **Monitors key water quality parameters:**
 - pH, temperature, electrical conductivity, dissolved oxygen, etc.
 - Some sensors are normal, but others are malfunctioning or uncalibrated.
- Limited ability to automatically alert when water quality standards are exceeded.

11. water distribution pumps and frequency control (WTP2)

- There are four water distribution pumps in WTP2.
 - Currently only one unit is in operation (remote startup, but frequency is manually adjusted).
- WTP3 has introduced automatic control with VFD, but WTP2 sets the frequency manually.
- WTP2's SCADA can view trend displays, curves, and alarm history, but **operation is still manual**.

12.

12. challenges with SCADA software and vendor support

- The biggest concern is lack of vendor support after implementation:
 - SCADA vendors (**Singapore**, France (WTP2), Japan (WTP1)) withdrew after installation, no maintenance contracts.
 - Users have no access to software update files, technical documentation, or licenses.
- SCADA reporting system (**e.g., Raypod**) stopped functioning because monthly update files were not received and applied.
 - Update files are shared only with the system integrator.
 - Without updates, false alarms and malfunctions occurred.
 - Currently not in use.
- Difficult to contact vendor:
 - Dispatching a vendor's technician to Cambodia would require overseas travel expenses,

which would be more expensive than the cost of the software.

- No local technical support system exists.

13. views of the survey team

- The following measures are needed
 - Establishment of a local agency or a support system through a long-term contract.
 - Training for users for alarm handling and maintenance.
 - Upgrade to SCADA with multi-user support and local control.
- On-site operations are fragmented and manual due to lack of tools, automation, and support systems compared to WTP3.

13. Meeting Minutes (Observation) -Head of Accounting Dep.

Date: 9:00-10:00 on Aug4, 2025

Location: meeting room on the 3rd floor at SRWSA

Attendees: SRWSA

SRWSA: 1 Mr. Pheng Bunhor

1 Mr. Pheng Bunhor, Director of the Project Management Department

Ms. Meas Vichana, Chief of the Accountant

JICA Expert Team and National Assistant: 1.

1 Mr. Atsuo Ohno

Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Srorn Piseth

Outline of Business Plan

- The current business plan covers the period from 2022 to 2026.
 - SRWSA is currently developing a new business plan for 2026-2030, which will include the following
 - Investment Plan
 - Business plans for each department (including administration) 2.
-

2. enhancement of the SUMS system (digitalization progress)

- Three new functions will be added to the current SUMS (management system):
 - Payroll
 - Customer Service
 - House Connection
- Background:
 - Since 2007, all HR-related tasks (staff profiles, payroll, performance evaluations) have been managed in Excel.
 - A new system module was approved by the Board and Director this year.
- Implementation Plan:
 - A Malaysian company (with a local agency in Cambodia) assisted in the implementation.
 - Local staff will begin preparations in August 2025.
 - Implementation period: 6 months
 - Scheduled start of operation: January 2026
- Current understanding:

- Ms. XXX is not familiar with the detailed functions of the new system.
- Similar modules have been implemented in other provinces, mainly accounting systems, but HR systems are not yet commonly implemented.
- PPWSA (Phnom Penh Water Supply Authority) used to use all modules of SUMS (it is unclear if they are still in use); SRWSA has the same system and configuration, but currently uses only some modules.

3. issues in human resource management

- **Recruitment:**
 - Difficulty in finding qualified applicants that meet SRWSA's requirements.
 - Transfers between departments, e.g., from accounting to administration, are common.
 - Graduates of business universities are multidisciplinary and can work in multiple departments.
 - MISIT (Ministry of Industry, Science, Technology, and Innovation) directs the Water Authority not to easily hire new employees, and SRWSA also utilizes internal transfers.
- **Selection Process:**
 - Until last year, no formal hiring process existed.
 - Beginning this year, a selection process was implemented at the direction of the Chairman.

4. current salary payment process

- **Monthly payroll:**
 - Paid via bank transfer on the 28th or 29th of each month.
 - Paid twice a month (mid-month and end of month), in accordance with government regulations.
- **Workflow:**
 - HR (human resources) department performs payroll calculation.
 - The accounting department checks the details.
 - What is included in the salary?
 - Base salary (based on work performance)
 - Overtime allowance (calculated based on applications from each department)
 - Incentives based on performance
 - Currently, all calculations are performed in Excel.
 - Expected improvements: The system is expected to make payroll processing much simpler and more efficient.

5. staffing and planning

- **Current staffing: considered adequate.**
- **Future staffing plan: Will be adjusted as the number of clients increases. No specific plans. If the number of customers increases , the number of meter readers will be increased accordingly.**
 - **Example: Currently there are 9 meter readers.**
 - **Originally there were 10, but one was promoted to an office position, so now there are 9.**
 - **The company would like to hire one more person to handle the increase in the number of customers in the future.**

14. Meeting Minutes (Observation) -250804_Head of Commercial Dep

Date: 10:00-11:00 on Aug 4, 2025

Location: meeting room on the 3rd floor at SRWSA

Attendees: SRWSA

SRWSA: 1 Mr. Pheng Bunhor

1 Mr. Pheng Bunhor, Director of the Project Management Department

2 Mr. Sam Senghan, Deputy of the Commercial Office

JICA Expert Team and National Assistant: 1.

1 Mr. Atsuo Ohno

Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Srorn Piseth

Organizational Structure and Main Responsibilities

- **House Connection Section**
 - **Receives new connection requests from customers.**
 - **Prepare documents related to new connections.**
 - **Customer Service Section**
 - **Checks the accuracy of customers' water meters.**
 - **Relocation of meters in response to customer requests (e.g., road construction).**
 - **Collection of delinquent bills.**
 - **Discontinues water supply if payment is more than 15 days late.**
 - **Revenue Office**
 - **Meter reading, data entry, billing, and delivery.**
 - **Currently employs 9 meter readers; one has been promoted to office chief.**
 - **One person has been promoted to office chief and one additional person will be hired in the future (a total of 10 people are expected to be adequate).**
 - **Due to government policy, staffing cannot be increased.**
 - **Staff reductions can be considered through the introduction of equipment and technology.**
- 2.**

2) Operational status of meter reading operations

- **Number of customers served per meter reader: 2,000-3,000.**
- **Average number of meter readings per day: approximately 120.**
- **Operates on Saturdays and Sundays as needed.**

- It is difficult to handle more than 3,000 readings per person.
- Work schedule:
 - Morning: Meter reading, recording, and billing.
 - Afternoon: Deliver bills to locations where meter readings were taken in the morning.
- PPWSA uses equipment that can issue bills on the spot, but SRWSA has not yet installed such equipment. 3.

3. water meter accuracy verification and replacement standards

- Use test kits for accuracy verification as needed.
- If the meter is within the allowable error of 3%, it continues to be used.
- If it exceeds the standard, replace the meter.

Meter diameter Inspection frequency

15 mm Every 10 years

25-40mm Every 5 years

100mm every 2 years

- Brand used:
 - *Kent* (US\$35, made in Malaysia) - mostly used, high quality.
 - *Aichi Tokei* (US\$20, made in Vietnam) - small number, used since 3 years ago.

4. challenges in the commercial sector

- Pipeline expansion and bill delivery:
 - Expansion of the pipeline network makes invoice delivery time consuming. Expansion to more distant locations.
 - In 2023, 23 communes in and outside of Siem Reap province were added to the target area by MISTT's direction.
 - Of these, 11 communes are in the SRWSA service area.
 - The national policy is to achieve 100% dissemination of safe water. Water pipelines are not yet in place in some areas.
 - Some areas have poor groundwater quality and wish to be connected to SRWSA.
 - Priority will be given to densely populated areas.
- Risk of pipe breakage due to future land development (e.g., embankments).
- Low water usage among connected households:
 - In some cases, residents are using borehole water from shallow wells or other sources and do not wish to be connected to the water system. Water quality is not very good in some places.

- Hotels and guesthouses also tend to have their own groundwater facilities and do not connect to the water supply.
 - **Stagnant revenues:**
 - The number of commercial connections is decreasing due to the slowdown in the tourism industry, affecting revenues.
 - Some customers have delayed payments, but not many.
 - Sometimes due to leaks or from low-income households, the company receives negotiations to reduce the amount of bills.
 - In 2010, there was a case of 3-6 months in arrears and the water supply was suspended.
 - Some residents believe that "water is free" and have low awareness regarding water supply.
 - Awareness-raising activities are underway within the Department.
-

5. rate system and billing policy

- **Rate revision:**
 - The last revision was in 2017.
 - By law, rates can be revised every 5 years.
 - Due to increased debt, SRWSA wishes to revise.
 - After consultation among relevant departments, such as Finance and Commerce, a proposal will be made to MISTL.
- **Billing criteria:**
 - If monthly usage is less than 1 m³, no invoice is issued but maintenance fee is payable.
 - Since 2017, invoices are issued for usage of 3 m³ or more.
 - Since 2014, invoices are issued only to "active customers".

15. Meeting Minutes (Observation) – Accounting Dep.

Date: 11:10-12:00 on Aug 4, 2025

Location: Accounting Dep. on the 2nd floor at SRWSA

Attendees: SRWSA

SRWSA: (name and address)

1 Mr. Pheng Bunhor, Director of the Project Management Department

2 Mr. Sam Senghan, Deputy of the Commercial Office

JICA Expert Team and National Assistant: 1.

1 Mr. Atsuo Ohno

2. Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Srorn Piseth

1. new connections and client classification

- **New connection:**
 - New connections are made by the Revenue Office based on customer applications.
- **Current active connections: 27,225 total**
 - **Domestic: 23,863 connections**
 - **Commercial (including industrial): 3,200 connections**
 - Commercial and industrial use will be categorized separately in the future.
 - **Public Institutions: 162**

Trends toward digitalization of meter reading

- **Pilot project at PPWSA (Phnom Penh Water Supply Authority) (as explained to Mr. XXX by a SUMS representative):**
 - Customer's water meter is scanned with a smart phone and the read data is transferred to the SUMS system.
 - The SMUS representative called this system "AI meter reader".
 - However, the technology is likely to be OCR (Optical Character Recognition) rather than AI.
 - Details of the technology and its actual use need to be confirmed.
 - Currently in pilot phase, PPWSA plans to share results and progress with SRWSA.
 - It has not yet been confirmed whether the pilot phase has been completed.
- **SRWSA Interest:**
 - If the operation of this system is confirmed to be effective, SRWSA would like to implement

it.

- The objective is to save time and improve the efficiency of meter reading operations. 3.
-

3) Concerns about maintaining the operation of the system in the future

- Concerns of the survey team (Obara):
 - Concerns about whether the current analog method (manual meter reading and O&M) can be continued in the future as the number of customers increases and the service area expands.
 - As the coverage area expands, the workload will increase, and the current system may not be able to handle the increased workload.

16. Memo of site visit (Observation) -Construction site of pipes (Azenza)

Date: Aug 4, 2025

A free application called Avenza Maps has been downloaded to the cell phones of the staff of the NRW Office, Customer office, and House connection office.

Download Excel data from AQUA crew.

→Read the Excel data in QGIS.

→Export as KML data from QGIS

Download KML data at →Avenza

Cannot export KML data directly from AQUA Crew. Cannot export ".prj files" with coordinate data. SRWSA has developed its own way to do this. One staff member complained that AQUA Crew was difficult to use.

One staff member complained that AQUA Crew was difficult to use. Then, import it into Avenza Maps.

Then, the KML data can be viewed from Avenza Maps. Notes, points, etc. can be added, but in order to reflect them in AQUA crew, it is necessary to manually update AQUA crew after returning to the office (by asking the staff member who uses AQUA crew).

There is a concern about security because there is a free application.

KML data downloaded by each individual may not be the same (because they download at different times). The data is not loaded on the cloud.

Because the data is heavy, only the necessary zone data is downloaded. When other zone data is needed, delete it and download new KML data.

17. Meeting Minutes -AQUA Crew

Date: 8:30-10:10 on Aug 5, 2025

Location: AQUA Crew room on the 2nd floor at SRWSA

Attendees: SRWSA

SRWSA: 1 Mr. Pheng Bunhor

1 Mr. Pheng Bunhor, Director of the Project Management Department

2 Mr. Luon Soknoun, Deputy of the Project Management Department

JICA Expert Team and National Assistant: 1.

1 Mr. Atsuo Ohno

Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Srorn Piseth

For details on how to view the AQUA Crew data in Avenza, please refer to "250804_1430_Site visite (2 bulk meters and 2 pipe construction sites)".

CSV files exported from AQUA Crew must be manually formatted (sorted, collated, etc.) in order to be read by SMUS. The exported CSV data cannot be imported by SMUS as-is.

Every six months, the CSV data, which includes water usage, customer information, etc., is reflected in SMUS.

AQUA Crew reflects the pipe network data, customer information, and leak locations at this time. Master Data.

SRWSA also needs to request Geocraft to perform pipe network analysis with different water supplies (in data acquisition).

Therefore, SRWSA uses QGIS for pipe network analysis and studies based on new piping data, etc.

It is conducting its own demand forecasting, pipe network analysis in EPANET, etc. Although this is a draft version, future demand forecasts are being conducted. They would like to consult with experts on the details in the master plan PJ scheduled in the future.

If there are any leakage points on site, staff will respond. The information on the leakage points will be compiled into a report. The local project office will receive the report and update the data in the AQUA Crew.

SMUS outputs the asset data in Excel. This is double-checked with the AQUA Crew asset data.

SRWSA talked to Geocraft about system integration with SUMS.

Geocraft informed us that they need to match the AQUA Crew data format.

They have contacted SUMS but have not yet received a response.

SRWSA staff is aware that we need to meet with SUMS and Geocraft to finalize the details. However, they understand that there will be costs associated with this.

The survey team: Customer data in SUMS is reflected in AQUA Crew once every six months, albeit manually (by hand). Also, today's discussion focused on data format rather than system integration.

18. Meeting Minutes (Observation) - Water supply Dep. (O&M procedure)

Date: 10:10-11:00 on Aug 5, 2025

Location: AQUA Crew room on the 2nd floor at SRWSA

Attendees: SRWSA

SRWSA: 1 Mr. Pheng Bunhor

1 Mr. Pheng Bunhor, Director of the Project Management Department

2 Mr. Kimleng (Senior local mercenary, studied in China, coding, python, etc.) He is a senior of local charterer, knows China study, coding, python, etc. He is the person who is thinking how to bring AQUA Crew to Avenza and is familiar with QGIS, EPANET, and pipe network analysis. He also knows how to do leakage surveys. He has been in Japan for about a month for JICA training and hopes to obtain a PHD.)

JICA Expert Team and National Assistant: 1.

1. Mr. Atsuo Ohno

2. Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Srorn Piseth

SOPs are in place and maintenance is being conducted in accordance with these SOPs.

Leakage points are also managed in Excel. The staff enters the information in Excel, and when Kimleng checks it, it is colored yellow.

The vertical axis is the name of the road, and whether there is a leak or not is recorded as a maintenance record.

In addition to leaks, the company also records in Excel the cleaning records (Flashout) in the water pipes.

A maintenance schedule is also prepared.

The areas where valve covers need to be raised due to road construction, development, etc. are also recorded.

Valve opening and closing records are also recorded. Although the system is not operated in principle, Valve is opened and closed for maintenance purposes such as repairs.

Forms for checking the accuracy of customer meters are also maintained.

Maintenance records are in Excel files only.

For preventive maintenance, all water distribution pipes are checked and all valves are checked once a year.

In addition, WTP3 sends a daily photo of the water distribution volume for each Bulk meter (meters located at the entrance of each zone) for confirmation of water distribution volume. Telegrams are used. It is then entered into Excel.

In addition, once a month, the Excel data on water distribution volume is shared in an Excel file.

MISTI has instructed each water utility to make a demand forecast for the period 2026-2030.

SRWSA is also conducting its own demand forecasting and pipe network analysis using QGIS based on this.

Kimleng has independently learned Visual studio Code and is utilizing it in Excel.

19. Meeting Minutes (Observation) - Stock yard Status (Accounting Dep.)

Date: 11:10-11:40 on Aug 5, 2025

Location: Stock yard at 1st floor at SRWSA

Attendees: (in alphabetical order)

SRWSA: 1 Mr. Pheng Bunhor

1 Mr. Pheng Bunhor, Director of the Project Management Department

2 Mr. Kimleng Accounting Dep. man (also interviewed last week)

JICA Expert Team and National Assistant: 1.

1. Mr. Atsuo Ohno

Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Srorn Piseth

The new stock yard has just been constructed on the site of WTP1 and 2. Shelves have been set up for the installation of equipment and materials.

From now on, almost all of the materials and equipment will be transported to the new stock yard.

The current stock yard will be used only for customer meters and materials needed to connect customer meters. (For customer service, it is about a 30-minute drive to WTP 1 and 2).

When customer meters are taken out of the Stock yard, they will be handwritten in a notebook. Then we will compile it into an Excel file.

(The following must be verified).

All materials and equipment are first managed as "Stock in" at SUMS.

When you want to use them, you need to apply for stock out, and only after approval, you can take them out from the stock yard.

Stock in: Need equipment and materials → Application for purchase (paper) → Approval (paper) → Purchase → Arrival (entered in SMUS as Stock in?) Stock in: Need to use the equipment→Apply for stock out (paper)

Stock out: Use the equipment→Apply for stock out (paper) →Approve (paper) →Use (send out), also written in SUMS

20. Meeting Minutes (Observation) -WTP Monitoring and site visit

Date: 14:30-16:00 on Aug 6, 2025

Location: WTP3 SCADA Room

Attendees: SRWSA

SRWSA: 1 Mr. Pheng Bunhor

1 Mr. Pheng Bunhor, Director of the Project Management Department

2 Mr. Meng Hengkim Lin, SCADA operator (Distribution department)

3 Ms. Seang Ravy (water quality test)

JICA Expert Team and National Assistant: 1.

1 Mr. Atsuo Ohno

2. Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Srorn Piseth

I can monitor the status of WTP2 from WTP1, but not from WTP2.

Because we are using remote desktop, we can monitor WTP2 from WTP1. This is not SCADA.

Items that can be monitored and controlled from WTP1

WTP1 (partial control)

WTP2 (monitoring)

WTP outlets (Flow, Mpa for 2 meters)

The 8 additional Intake units are manual switches only.

Can be monitored and controlled from WTP2. n

WTP2 (almost everything can be operated remotely)

WTP2 outlets (Flow, Mpa for one meter)

Water intake pumps are located on site.

Can be monitored and controlled from WTP3 also n

WTP3 (almost everything can be operated remotely)

Outlets of WTP1,2,3

Inlets in Zone 2 to 7

On/Off of water intake pumps located 10 km away can be remotely controlled.

Status other than WTP1,2 outlets cannot be monitored.

There are no current problems with sedimentation from intake pipes or odors from fish carcasses; what MISTI described is a past situation. Currently, only one of the two pipes is used, so they are not experiencing such problems.

WTP3 is currently operating from 6:00 AM to about 4:00 PM. The operating efficiency based on operating hours is about 42%.

Current water purification capacity is 11,000-12,000 m³/day.

The initial design calls for 24-hour operation.

No water is currently distributed to Zone 7.

21. Meeting Minutes (Observation)-Accounting Dep.

Date: 9:40-10:10 on Aug 6, 2025

Location: AQUA Crew room on the 2nd floor at SRWSA

Attendees: SRWSA

SRWSA: 1 Mr. Pheng Bunhor

1 Mr. Pheng Bunhor, Director of the Project Management Department

1 Ms. XXX, Accounting Dep.

JICA Expert Team and National Assistant: 1.

1 Mr. Atsuo Ohno

2. Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Srorn Piseth

Functions of SUMS currently used by WSA

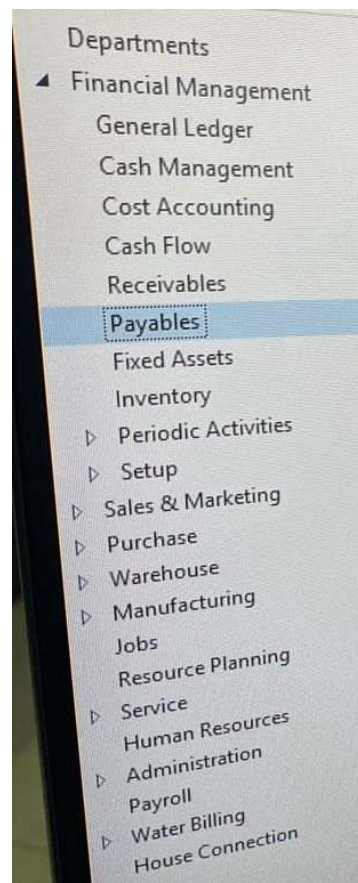
Financial Management

- General lodger
- Receivable
- Fixed asset
- Inventory
- Payables

Water Billing

3 functions to be added in January next year

- Payroll
- Human Resources
- House connection



22. Meeting Minutes -KWS Mr. Kiyama

Date: 11:10-12:10 on Aug 5, 2025

Location: 3rd floor at SRWSA

Attendees: Mr. Kiyama

SRWSA: 1 Mr. Pheng Bunhor, Director of the Project Management Department

1 Mr. Pheng Bunhor, Director of the Project Management Department

Kitakyushu Water Service (KWS)

Kitakyushu Water Service (KWS)

JICA Expert Team and National Assistant: 1.

1 Mr. Atsuo Ohno

2. Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Srorn Piseth

Outline of the Ministry of Foreign Affairs Free of Charge Project (Target: PPWSA)

- **Project name:** Integrated Platform Development Project (free of charge by the Ministry of Foreign Affairs)
- **Period:** XXX - 2027 (to be completed in 2027)
- **Objective/Function:**
 - **Centralization of data and real-time monitoring**
 - **Extraction and visualization of necessary indicators and data (including Dashboard function)**
 - **Monitoring of water treatment plant electricity consumption**
 - **Demonstration test of valve control**
- **Target systems:**
 - **SUMS:** In use by PPWSA and SRWSA; based on Windows Dynamics. The MOFA free PJ will extend PPWSA's SUMS functionality.
 - **Challenges:** High license fee (PPWSA will pay a total of 2.3M USD per year in the future when using the functions to be added this time).
 - **GIS software:** PPWSA has been using KIS for many years; API is not yet open, which hinders integration; migration to AQUA Crew has not progressed. Mr. Kinoshita is aware that KIS will not bother to create an API for this project.
- **Expected Benefits:**

- Visualization of planning, inventory management, incident response, etc. ? ? ? ?
- Potential to be a model for a digital integrated infrastructure for national water utilities, including SRWSA. 2.

2. current status of PPWSA and DX initiatives

- **System integration: Linking SUMS and water meter data to automatically calculate non-revenue water ratio (see below).**
- **Smart meter testing:**
 - Testing underway with multiple manufacturers (e.g., E-Water).
 - Bluetooth-reading type (meters can take measurements when a meter reader approaches); piloting with some customers.
 - Challenges exist in terms of cost and dissemination (for reference, smart meters are not widely used in Japan due to inexpensive labor costs for meter readers).
- **Water quality monitoring and DMA integration (Korea-supported PJ):**
 - 184 DMAs targeted. Integration of more than 200 devices including water quality meters.
 - The objective is not just meter installation, but integrated management on a parcel-by-parcel basis.
- **Complaint handling:**
 - Received by phone and telegram
- **Leakage management application:**
 - SenseWater (made by Yokogawa) is used: get customer data from SUMS, get DMA data from SenceWater, sort by DMA, and calculate yield for each DMA. Frequent NRW can be ascertained.
 - High failure rate of DMA meters is an issue.
- **Future Plans:**
 - Plans to move to data analysis using machine learning in the development of the Nilot Water Treatment Plant.
 - Aim to enhance decision making through data visualization.

3. status and challenges of SRWSA

- **Background of SUMS implementation: Requested by MISITI; MISITI also wanted to understand SRWSA's electricity usage.**
- **Challenges:**
 - **Lack of technical capacity:** absence of a technical middleman, limited understanding of calculations and analysis (e.g., "magic" understanding of some technical details was observed)
 - **Demand variability:** delayed recovery of hotel demand after Corona; large differences in water demand by zone; lack of technical expertise; lack of understanding of the technical

aspects of the project; lack of technical expertise to understand the technical aspects of the project.

- **Master Plan:**
 - **First edition: 1995**
 - **Kiyama** conducted field survey in **2010** to forecast demand; **NJS conducted facility planning (not master plan)**
- **Future Outlook:**
 - **Based on the results of this study, a new master plan preparation PJ is scheduled to start in 2026**

4. aqua crew and GIS

- **Development Background:**
 - **Jointly developed by Kitakyushu City and GeoCraft.**
 - **Water distribution management system from the 1990s was integrated with GIS.**
- **Features:**
 - **Advantage: UI/functions** specialized for waterworks.
 - **On the other hand, there are limitations in applicability to other fields.**
- **Utilization for SRWSA:**
 - **Effective for inventory management and visualization of accident response.**
 - **In the next two years, we will proceed with the installation of applications and specification development.**

Part 2: Smart Meter Installation Status and Issues (PPWSA)

- **Status of Smart Meter Deployment**
 - **PPWSA is currently testing several smart meter devices.**
 - **Example of a developer: eWater (Cambodian IT company)**
 - **Introduced a model that can be read by meter readers via Bluetooth.**
 - **In some cases, meter reader access is difficult due to the location of meter installation on the premises.**
 - **Smartphone-readable meters have practical issues such as counters being dirty and unreadable.**
 - **Price of smart meters: expensive at approximately 250 USD/unit.**
- **Factors preventing widespread use**
 - **One of the reasons why meters are not widely used in Japan is the low labor cost of meter readers.**
 - **(e.g., in Kitakyushu City, the cost is 20 yen per meter reading.**

- May be suitable for apartment complexes, but difficult to introduce to individual residences.
 - **Current Response Policy**
 - PPWSA installed the system for some customers as a pilot project.
 - Customers are charged normal meter rates, and cost sharing for smart meter renewal has not yet been determined.
 - Due to many technical and operational issues, the next phase of deployment has not yet been reached.
-

5. digital architecture concept and JICA's involvement

- **Involvement of Mr. Kiyama**
 - At the request of JICA, Mr. Kiyama prepared the "Digital Architecture Proposal for Integrated Platform" as part of the Ministry of Foreign Affairs' grant project.
 - Although he was not present at the actual meeting, he recognizes the importance of sharing the draft.
 - **Mr. Kiyama's view**
 - The significance of "digital architecture" is difficult to convey at the field level.
 - Those in charge (water treatment plants/water distribution network/inventory management, etc.) understand the benefits of management on the same platform.
 - Example: Visualization of inventory and accident information in AQUA Crew → Contributes to future business planning and more efficient response to accidents.
 - **Proposed elements in the JICA project**
 - Promote application installation, specification development, and visualization (to be realized in the next 2 years)
 - The integrated application is expected to enable the use of other peripheral applications.
 - However, another issue is that Windows Dynamics-based SUMS is very expensive.
-

6. additional background and expertise of Mr. Kiyama

- **Mr. Kiyama has been engaged in overseas operations since 2003.**
- **He has also experienced DX projects in Japan for about 7 years.**
- **He was involved in the development of Aqua Crew from the early stages and is familiar with its affinity with field operations.**
- **He was also involved in the Siem Reap water source survey (around 2010) and has experience providing survey data to NJS.**

23. Meeting Minutes (Observation) -Findings explanation

Date: 15:30-16:00 on Aug 6, 2025

Location: 3rd floor at SRWSA

Attendees: (1)

SRWSA: 1.

1. H.E. Chan Sengla, Director General

Mr. Yay Monirath, Deputy Director General

Mr. Kot Nimol, Deputy Director General

Mr. Sok Hout, Deputy Director General

Mr. Pheng Bunhor, Director of the Project Management Department

JICA Expert Team and National Assistant: 1.

Mr. Atsuo Ohno

Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Srorn Piseth

1. overview

- **Explanation of the current situation by Mr. Ohno (visualization on a paper mache + sticky notes) and policy comments from the upper management 2.**

Main comments from Director General

- 1. Importance of step-by-step promotion:**
 - **Step-by-step is important to introduce digital tools. You can't just jump up and down.**
- 2. Emphasis on human resources and organization:**
 - **In parallel with the introduction of digital technology, it is essential to strengthen the capacity of staff (training and retention support).**
- 3. Benchmarking and compatibility:**
 - **Based on the comparison with PPWSA, we would like you to propose solutions necessary for SRWSA.**
 - **We would like to see realistic steps to reach the goal of getting as close to PPWSA as possible.**

資料 6-2 : 第 2 回現地調査 (SRWSA)

Main Points of Discussions

Date: October 30, 2025

Time: 9:00 - 11:30

Venue: SRWSA Meeting room

Attendees: MISTI

MISTI: H.E.KHUT Vuthiarith - Under Secretary of State

H.E.KHUT Vuthiarith - Under Secretary of State

Mr.Phea Sinat - Chief of Technical Office

Mr.Ly Chansothea - Chief of Data Management Office

SRWSA: H.E. Chan Sengler

Mr. H.E. Chan Sengla - Director General

Mr. SEAK Pengkeang - Deputy Director General

Mr. Pheng Bunhor - Director of the Project Management Department

JICA: Mr. Youk Seng An An

Mr. Youk Seng An

JICA Expert Team: Mr. Atsuo Ohno

Mr. Atsuo Ohno - Team Leader

Mr. Koichi Ogata

Mr. Ohara Yu

Main Points of Discussion 1.

Explanation of Analysis Results Based on the First Survey

The Team Leader, Mr. Ohno, provided an explanation based on the handout materials (A4 x 2 sets). 2.

Questions and Answers

H.E. KHUT Vuthiarith: Expressed appreciation for the DX-related

Expressed appreciation for the DX-related survey.

(1) H.E. Chan Sengla: The reported results accurately reflect the current situation.

As discussed in today's agenda, smart meters are expensive; therefore, it would be more practical to develop a DX-related survey. As discussed in today's agenda, smart meters are expensive; therefore, it would be more

practical to introduce a system capable of reading existing meters. SRWSA agrees with the current proposal and also recognizes that staff development is crucial when implementing DX.

(2) Mr. SEAK Pengkeang: I appreciated for the survey team to summarize.

I appreciated for the survey team to summarize the findings and the results appropriately. In addition, as we are currently developing the SRWSA Master Plan, how will it align with the DX? Among the 14 proposed potential solutions, is there any specific order for implementing the solutions?

The specific order for the implementation of solutions has not yet been considered, While, a simplified roadmap will be included in the final report, so it would be an additional information. Regarding the second question, the survey team is not to be a position to mention about the on-going Master Plan clearly, while the survey team heard that the Master Plan has not yet been considered. Please note, however, that the SRWSA Master Plan will not be a comprehensive master plan, but will include the DX survey results including the solutions. Please note, however, that the SRWSA Master Plan will not be the DX master plan.

(3) Mr. Ly Chansothea: Human resource development is essential for implementing DX.

We would like to understand what types of facilities/equipment are required for each proposed solution, what benefits can be expected. In Cambodia, smart meters are perceived as expensive as the In Cambodia, smart meters are perceived as expensive as the survey report also mentioned, and water utilities prioritize pipeline expansion to increase water supply coverage. We are concerned that DX implementation may increase operational costs, especially given the current difficulty of revising water tariffs.

→ We are concerned that DX implementation may increase operational costs, especially given the current difficulty of revising water tariffs.

Because we have only limited cost information on the potential solutions at present, the cost evaluation in our score sheet would be very rough. It is important not merely to introduce DX technologies, but to apply them in ways that address operational challenges of SRWSA. It is important not merely to introduce DX technologies, but to apply them in ways that address the operational challenges of SRWSA.

(4) Mr. Phea Sinat: I concur with the survey results.

The key challenge for introducing DX facilities lies in addressing financial constraints. The key challenge for introducing DX facilities lies in addressing financial constraints. When implementing DX facilities through future JICA projects, please ensure that daily operations are not overly affected, and consider human resource development alongside equipment installation. .

→ Mr. Atsuo Ohno: For now, SRWSA basically should not be a target to progress.

For now, SRWSA basically should aim to advance by one level. If aiming higher, the proposed solutions would be different from the ones proposed this time and would need to be revised accordingly. If aiming higher, the proposed solutions would be different from the ones proposed this time and would need to be revised accordingly.

(5) H.E. KHUT Vuthiarith: Thank you for your valuable comments.

The evaluation by the Survey Team has helped us reaffirm SRWSA's current situation. MISTI will consider to include digital transformation as a component in the national strategy and closely continue MISTI will consider to include digital transformation as a component in the national strategy and closely continue monitoring the rapid progress of digital technologies.

Since my tenure as Director General of SRWSA, I have recognized the importance of system integration during my training in Japan. I observed that PPWSA had already automated meter reading.

Currently, SRWSA's water supply coverage has not yet reached 50%, and issues such as customers not willing to connect to pipelines some time. As the result, it may cause in low revenue, making it difficult to adopt new technologies due to cost concerns.

When we look at an overall status of water service both by public and private sectors in Cambodia, the main challenges are to improve water quality and water While, MISTI will consider to adopt a new technology in water sector.

In addition, MISTI request for JICA to consider a cooperation in implementing pilot projects at Cambodia. SRWSA is also conducting training with surrounding water utilities, and by positioning This survey will serve as a foundation for future discussions.

(6) Mr. Koichi Ogata:

In the first survey, we identified challenges such as the existence of multiple unlinked GIS systems and the need to expand When developing the DX Strategic Master Plan, we intend to consider whether and how to integrate and link future systems. When developing the DX Strategic Master Plan, we intend to consider whether and how to integrate and link future systems.

The plan will also address implementation and maintenance costs, human resource development, and organizational structure. The plan will also address implementation and maintenance costs, human resource development, and organizational structure.

(7) Mr. Ly Chansothea: We understand that system integration will require coordination.

We understand that system integration will require coordination with existing system vendors. The Microsoft Dynamics license currently used in the SUMS system for SRWSA is set to expire, and this should be taken

into consideration. We should also review examples from other projects regarding system integration approaches.

→ The Microsoft Dynamics license currently used in the SUMS system for SRWSA is set to expire, and this should be taken into consideration.

For instance, the JICA project in India, the integration of some SCADA systems has carried out by ensuring compatibility of the Thus, it could be an important point on how to verify and ensure the compatibility between the existing system and the Thus, it could be an important point on how to verify and ensure the compatibility between the existing system and the new system.

(8) Mr. Atsuo Ohno: Thank you for your valuable comments.

We plan to prepare the final report that will be shared by JICA.

The finalized minutes of this meeting will be sent by the Survey Team to Mr. Pheng Bunhor and subsequently reviewed and confirmed by MISTI.

Meeting Minutes _ Exchange of opinions with Mr. Bunhor (additional questions)

Date: 10:00-11:00 on Oct 31, 2025

Location: Meeting room on the 3rd floor at SRWSA

Attendees: SRWSA: Mr. Bunho

SRWSA: 1.

Mr. Buhor

JICA Expert Team and National Assistant: 1.

Mr. Atsuo Ohno

2. Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Khan Srun

<Additional questions about the digital capability map

Check if they use E-Mail, SMS, Telegram, etc. (communication with customers) -> mainly telegram, mobile (customers)

1 bank 1 app. (in charge of social dep.), 9 partner banks (online payment possible). 8 can pay via app. The remaining one is still in preparation.

Water purification and distribution volumes are monitored. There is no centralized water treatment plant monitoring; WTP1 and WTP2, as well as WTP3, are being monitored separately. Is there a plan to install flow meters in the distribution pipe network in the future, or is there a policy to automate the distribution pipe network? → At this time, there are no flow meters installed in the water distribution pipes. Only piping installation. (Flow meters are not required for water supply pipes (65-225 mm diameter)). In the Bacon area, 20 km extension has been done, but no flow meter has been installed. 7 Zones (8 f flow meters. 8th is a flow meter to the airport).

The fixed asset ledger is being recorded in the SUMS system. CAD is used in construction design.

There is a regular maintenance plan. There is no medium- to long-term repair and renewal plan for the future according to the degree of deterioration. → The annual plan includes a repair plan, and the system information is stored in Aquacew. The system information is included in Aquacew. When it is time for renewal, Aquacew is used to draw out the renewal period and include it in the annual plan. Aquacew only manages the piping and flow meters (you can buy a license to use the asset management features; SUMS also has asset management (financial) features). SUMS also has an asset management (financial) function). At present, maintenance records are paper-based.

How to create a renewal plan for facilities and equipment: Example of an annual plan. A form that describes the renewal cost for the next year. It is not in the form of an individual facility renewal plan. For budget application, a renewal plan for the next year is created. Do you repair equipment after it breaks down? → If it looks like it is going to break, the operator makes a decision and applies for repair. It is not done after breakage. The senior manager of the water treatment plant makes a list of equipment that needs to be renewed. After that, staff members hold a meeting. The staff then meets and decides which items need to be renewed. During the meeting, priorities are decided based on the budget. The urgency level is determined based on the explanation of the person who proposed the idea. Next year, the budget will be in deficit due to Interest expense, depreciation, etc. In the group: Priority will be given to improving the efficiency of the current way of doing things rather than to making it more sophisticated.

The training will be conducted in Siem Reap Province and Oud Minh Choi Province, where private waterworks companies will come and receive training on leakage prevention. Piping, leakage prevention, etc.

SUMS maintenance costs are about 5,000USD per year. It is affecting the organization's budgeting process. The extended functionality is not yet available. When it becomes available, it will go up 10% per year. Next year it will be 5500. we are not sure how much the amount will be. we plan to be able to use it around February 2026 (initially).

Almost 100 data is stored on servers; there is also a SUMS server.

→ WTP3 servers are stored in the cloud in Singapore (Wester Mall). Buy the 1300USD package. When that capacity runs out, you buy another one. Only the flowmeter data is stored in the Singapore cloud at first; SCADA needs to store the flowmeter data in the cloud once in order to retrieve the data.

There is no system to request something between departments, but rather groups are created in Telegram and messages are exchanged within the groups. Telegram groups for the entire organization. There is also a department director group. Telegram is almost 100% as a communication channel.

Requests are made by the governor of the province, and the details are decided by the director group.

The IT department lacks technical skills and is not able to respond to cyber security issues. There have been no cyber security incidents to date. There have been some cases of hijacking of staff telegrams, but there have been no cyber-attacks on SUMS or other systems.

Above

Meeting Minutes _Exchange of opinions on solutions

Date: 14:30-16:00 on Oct 31, 2025

Location: SCADA room at WTP3

Attendees: SRWSA

SRWSA: 1.

1. Mr. Meng Hengkim Lin, SCADA operator (Distribution department)

Ms. Seang Ravy (water quality test)

JICA Expert Team and National Assistant: 1.

1. Mr. Atsuo Ohno

2. Mr. Koichi Ogata

3. Mr. Ohara Yu

Mr. Khan Srun

1. Opinions on solutions (SCADA updates for WTP1,2 (Solution 12) and SCADA integration with WTP3 (Solution 5))

- We believe that updating WTP1 and central monitoring with WTP3 are high priorities. We believe that updating the current system with WTP1 should come first.
- Each WTP has a different operation method. It is desirable to monitor WTP1 and WTP2 from WTP3. However, remote control would be difficult in reality, since operation is performed at each treatment plant. Operation should be performed at each of them.
- (Kohara question) Are there any difficulties in remote control with regard to the operation of each WTP?
- (Female) It would be better if WTP3 could be remotely controlled. The number of staff can be reduced. However, some parts of WTP1 are operated manually. It is questionable whether all operations can be remotely controlled. Also, WTP3, which will be the central monitoring base, may be difficult to remotely control due to communication problems with WTP1 and WTP2.
- After WTP1 was in operation, when SCADA matched the current facility, it could be operated from the SCADA screen.
- Around 10 years after installation, the WTP1 intake pumps have been struck by lightning twice; the first time was successfully handled, but the second and subsequent times have not. I don't think lightning rods were installed near the water intake facility. We contacted manufacturers in Cambodia. We also contacted a Japanese construction company, which visited Cambodia twice, and stayed for about two days to try to solve the problem, but we were unable to find the cause of the problem.
- It would be good to introduce a system for monitoring water quality on a regular basis. Currently, water quality is analyzed at (1) raw water intake, (2) water purification before distribution from the WTP, and (3) flow meters in each zone. It would be good to be able to monitor water quality in real time at each of these locations. 2.

Water pressure and residual chlorine concentration

- The area to the north of Zone 5 is relatively high in elevation and has higher water pressure than Zones 4 and 6, which are located to the south. The difference is about 0.04 Mpa. If the water distribution area is expanded in the future, it will be necessary to increase the water distribution pressure of the pumps from the water purification plant. If the water distribution pressure is increased, leakage from pipes near the water purification plant and other problems may occur.
- Once the water pressure near the SRWSA building is adjusted, the water pressure in other zones will be easier to manage. The water pressure in the center of town is 3 bar.
- All WTPs are served by the same distribution pipe network. There are flow meters and valves for zone closures at all zone inflows (connection points).
- No distribution ponds exist in the water distribution area.
- (In the future, the pressure problem could be solved by establishing a distribution pond and supplying water from the pond to the suburbs. This is one of the items to be considered in the water supply master plan. A water distribution pond is also useful from the perspective of maintaining residual chlorine levels.
- Currently, the residual chlorine concentration in residences is around 0.3ppm (government standard: 0.1-1.0ppm).

3. unit cost of water purification

- The water source of WTP1 is a well, which requires fewer chemicals for water purification treatment, resulting in the lowest annual unit cost for water purification.
- The water source of WTP2 is West Balai (reservoir), and the unit cost of water purification is higher than that of WTP1. The water quality of West Balai remains almost the same throughout the year.
- The source of WTP3 is Tonle Sap Lake, so the water quality (turbidity) varies greatly between the wet and dry seasons. In the rainy season, the amount of electricity and the unit cost of water purification are the same as WTP2, but in the dry season, the cost of chemicals and electricity is higher due to the higher turbidity. On average, WTP3 has the highest unit cost for water purification.
- The unit cost of water purification for the three treatment plants combined is approximately 1000 Riel/m³. Since household water consumption of 0-3 m³ is 900 Riel, the unit cost of water purification is in the red for households with small water consumption.
- Since usage fees vary by category, such as offices, factories, etc., the overall situation is that the recovery of fees exceeds the cost of water purification.

4. Water Supply Charges

- The current water rates in Siem Reap are the same as those used when WTP1 was constructed and have not been changed since then; the rate structure does not take into account the maintenance and management costs of WTP2 and 3. MISTI approval is required for rate revisions, but a previous application was denied.

- SRWSA's residential water rates are the highest among publicly owned water utilities; PPWSA charges approximately 700 Riel for 0-3 m3 of domestic water consumption.

5. Other

- Electricity cost in WTP2 is higher than in WTP1. It is necessary to confirm the basis of the calculation, but WTP1 sends the purified water once to the WTP2 water purification pond, and WTP2 distributes the water to the distribution network in batches. It is necessary to confirm how the calculations are made for this area.
- The operating efficiency of the water distribution pump at WTP3 is only about 60%, which means that high-efficiency operation has not been achieved. As a result, they consume a lot of electricity, causing high electricity bills.
- PPWSA has installed Green General's solar panels at the water treatment plant. The solar panels are maintained by Green General, and PPWSA purchases the electricity generated. The purchase price is lower than the market price.

Above.